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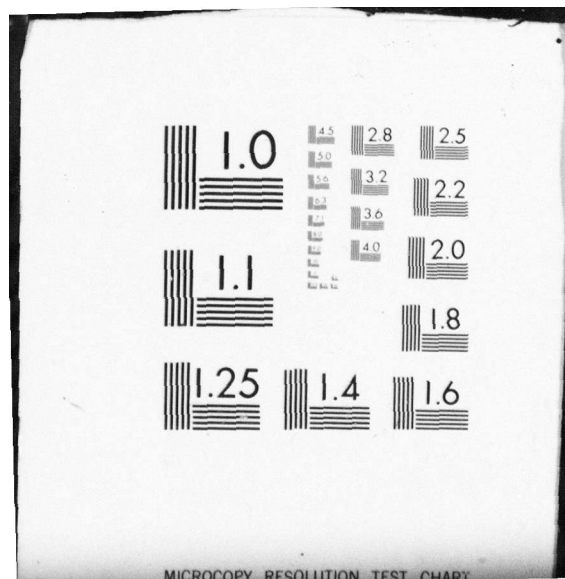
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
The objectives of this study were to: assess the experience in DOD with use of the Leader/Follower concept, evaluate views of acquisition and contracting managers in both industry and government about the concept, and to develop guidance for acquisition manager's use of the concept for complex products and systems. To meet the objectives of this study, the researchers conducted an extensive review of policies, regulations and legal documentation both directly and indirectly related to the Leader/Follower Concept and "Leader Company		

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Procurement." The researcher also interviewed government and industry managers about their experience with the concept and their viewpoints toward its use for complex systems requiring high investment in front-end research and development. While Leader/Follower has been used at least since World War II, current use appears to center on two related decisions. The first is a decision to develop a second source usually to reduce and control cost or assure supply. Cost objectives are usually achieved when production lasts for an extensive time. Assurance of supply arises as an objective due to known or anticipated characteristics of the developer/producer. The second decision is significant where it is feasible and necessary for the original (leader) source to provide extraordinary manufacturing assistance and "know-how" to a second source. The researcher found that for experienced contracting and acquisition managers, the Leader/Follower concept presented no new or unusual challenges.

Recommendation: Contracting and acquisition managers faced with the possibility of developing a second source for their products or systems should review the implications of using the Leader/Follower concept during planning and acquisition/business strategy sessions early in the program acquisition cycle.

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Final Technical Report on
Contract No. F33615-79-C-5073
AIR FORCE SYSTEMS COMMAND, ASD*

THE LEADER/FOLLOWER CONCEPT IN ACQUISITION

Charles W.N. Thompson and Albert H. Rubenstein

15 November 1979

ABSTRACT

This final technical report contains a description of the planning, design, and activities carried out over the six months period of the study, and a description of the decision model and guidelines which were developed. The extensive appendices provide supporting detail.

OUTLINE

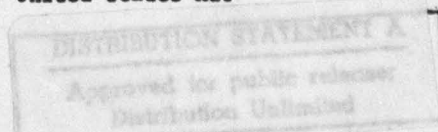
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EXECUTIVE SUMMARY

1. This study was directed to a brief review of the experience of government and industry with "leader company procurement" for the purpose of providing a basis for decisions concerning when and how to use the method. Leader/follower procurement, as defined in DAR 4-701, 2, 3 is an "extraordinary" method of second sourcing which requires the original developer/producer to provide assistance to a second source to enable him to produce and/or compete.
2. While leader/follower, and related forms, has been used at least since WWII, current usage appears to center on two related decisions. First, a decision to develop a second source, usually for one of two objectives: to achieve cost containment or cost savings through competing part or all of a large, extended production run; to achieve assurance of supply, either to meet a delivery schedule beyond the capacity of a single supplier, or to assure continued supply over an extended period. Achievement of the cost savings objective is usually realized where there is a large production run over an extended period; assurance of supply usually arises as an objective out of the known or anticipated characteristics of the developer/producer. The second decision--to use leader/follower--appears where it is both feasible and necessary to provide extraordinary manufacturing assistance and know-how to the second source from the developer/producer.
3. For experienced acquisition and contracting managers, leader/follower introduces no new or unusual challenges, and the model and guidance in this report should provide a useful (and sufficient) framework.
4. Incorporation of specific authorization (in the DAR) to negotiate and/or develop second sources to meet explicit objectives (cost savings, assurance of supply, socio-economic) should be considered.
5. Policy guidance should be directed to early specification of priority objectives, to early establishment of program parameters needed for planning, and to assurance of operational discretion to meet changing conditions, including discretion to discontinue use of leader/follower.

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1. INTRODUCTORY COMMENTS

The leader/follower concept in acquisition appears to be neither widely known nor commonly understood (at least, under that name), although the current DAR provisions (4-701, 4-702, and 4-703) have remained essentially unchanged since their first publication in May 1964. The concept, as described in 4-701, is as follows:

Leader company procurement is an extraordinary procurement technique under which the developer or sole producer of an item or system (the leader company) furnishes manufacturing assistance and know-how or otherwise enables a follower company to become a source of supply for the item or system.

A search of the records of the ASPR Committee reveals that these provisions were one of the products of a "Reduction of Implementation Panel", under the Assistant Secretary of Defense, Installation and Logistics, whose purpose was to reduce the volume of regulations by combining similar provisions in the regulations of the three services into a single provision in the ASPR. In a 1964 memo "leader company procurement" was described as "...a concept which is employed by all of the military departments and which is recognized in APP Section IV, Part 8; in NPD 34-203; and in AFPI 1-351." The brief record of the deliberations (over several months) suggests, however, that only the Army and Navy were using the concept and, further, "The Air Force and DSA members stated that their departments had no implementation on this subject and that it probably would not be used by their respective services..." The seeming inconsistency would appear to be primarily semantic. A further search of Air Force records reveals that AFPI 1-351 (20 December 1960) was entitled "Policy on Establishment of Secondary Sources of Aircraft Production" and went on to state that "broadening the industrial base during a period of national emergency" necessitates providing secondary sources "...with engineering help and technical assistance from (the original sources)." The provision continues with a review of the equitable interests of the primary source and the government, but does not contain language or phrases which appear in the current provisions. While the record discloses some minor redrafting by the ASPR Committee, it would appear that the origin of the current provisions is elsewhere, perhaps in the Army or Navy antecedents. In any event, it seems clear that the concept of developing a second source through furnishing manufacturing assistance and know-how from the original developer-producer not only predates the current provisions but also is known and used under other names.

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This anomaly—a relatively little known or understood name for an apparently well-known and understood concept—may serve to explain much of the uncertainty and ambiguity which has appeared during the course of this study, particularly in searching for and identifying those "special" characteristics which might serve to describe the leader/follower concept. Instead of a specific, well-defined concept applicable to meeting specific objectives under certain (applicable) conditions through use of specialized techniques, it appears that the concept (in practice) embodies a relatively wide set of objectives, conditions, and techniques intermixed with other related concepts (and practices). It may be argued that one of the unintended (or unexpected) consequences of this study is to demystify the term "leader/follower" and place it in its proper context among the many other concepts in the acquisition process.

The next section of this report will describe the study accomplished, and the next two sections will present guidelines and a decision-model derived from the study. The last two sections will comment on the testing of the model and guidance developed and present summary findings. The extensive appendices provide supporting detail.

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2. SUMMARY DESCRIPTION OF THE STUDY

A. Overview

The origin of this study is described in the contractual statement-of-work as follows:

"The lack of specific guidance for using the leader-follower concept for complex products and systems prompted Air Force Systems Command (AFSC/PM and AFSC/SD) to identify a need to conduct a research study of the leader-follower concept to develop guidance for acquisition and contracting managers to improve application of the concept. This need was identified by AFSC to the Air Force Business Research Management Center (AFBRMC) on 13 December 1977. As a result of this action, the AFBRMC published the research need in its Acquisition Research Topics Catalog in May 1978."

The overall strategy for the study can be described as an examination of current and recent experience, in terms of a search of the literature and interviews with knowledgeable individuals in procuring agencies and in industry, to identify what has been learned about the objectives to be achieved, the factors which facilitate or limit use, and methods and procedures.

The study was to be accomplished over a six months period in three equal stages. The first stage would consist, primarily, of identifying potential sources of information in the literature and in terms of knowledgeable individuals, and preparing for the gathering of data. The second stage would be devoted to the gathering of information through interviews with knowledgeable individuals. The third stage would develop, from the information received, guidelines and a decision-making model for applying the leader-follower concept.

This report summarizes the results of the study, and is organized to meet the reporting requirements specified in the statement-of-work. In this section a description of the activities in each of the three stages is provided, incorporating references to previously prepared reports (appearing as appendices) to avoid unnecessary duplication.

B. First Stage

There were two primary objectives (and activities) to be accomplished in the first stage (of two months duration). First, identify sources (documents

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and individuals); second, prepare a plan for gathering and analysing the information (during the second and third stages).

It was anticipated that the identification of sources would be difficult, necessitating use of a wide variety of search strategies and dependence on co-operation from an informal and loosely structured network of individual informants; and this expectation was realized. A description of the manual searches, machine searches, and personal contacts used to identify and obtain the documents included in Appendix E is provided in Appendix A (Section 1, pp. A-1, A-2). The initial identification of individuals was accomplished largely through the cooperation of individuals in the management research offices of the three services, with a few sources obtained from the literature, from prior acquaintances, and from opportunistic contacts. Using this initial base, names of other individuals were obtained during the course of interviews, and, without the supportive co-operation of individuals in the several procuring agencies, it would have been difficult, if not impossible, to identify the eventual set of knowledgeable individuals.

It was anticipated that most, if not all, of the literature references would be obtained during the first stage, and this turned out to be, largely, the case. The literature references obtained during the first stage were abstracted and submitted with the First Report (these references are now included in Appendix E). An analysis was provided in the First Report to characterize the nature of the literature, and this is included in Appendix A (Section 2, pp. A-4, A-5).

The second major activity of the first stage was to plan for the gathering of data during the second stage and the analysis during the second and third stages. This was a critical task, particularly in light of the exploratory nature of the study. The concept (and practice) of leader/follower appeared to be closely related to (and buried in) a wide variety of issues across much of the acquisition process. It was only one of many techniques, appearing in a wide variety of forms, and overlapping with other concepts and practices. Drawing upon background information from documents and individuals, prior experience with exploratory field studies, and analytical models developed and used for examining comparable unstructured problems, a preliminary data gathering and analysis plan was prepared, and this is described in Appendix A (Section 1. p. A-3; Section 3, pp. A-6, A-7, A-8).

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In summary, the activities required were carried out within the required schedule, providing a base for the second stage.

C. Second Stage

The second stage (also of two months duration) was to be devoted primarily to an intensive series of interviews with knowledgeable individuals within procuring agencies and industry. It was clear, at the outset, that only a representative selection would be achieved, and that limits on time and travel funding would require concentration on a few, salient programs. Visits were made to Washington, Dayton, and Huntsville to interview procuring agency personnel involved with seven of the eight programs listed in Table 2 (Appendix A, p. A-18). Personnel associated with three programs were unavailable at the time of visit; however, this was offset by the availability of individuals previously associated with two programs. In all, six of the eight programs were covered during these visits. (It should be noted that the original table listed ten programs; two of these were not pursued, and were deleted; a third did not involve leader/follower. The current listing of eight includes an additional program.)

During these visits, and through telephone interviews subsequently, names of knowledgeable individuals in industry were obtained, and a substantial, and representative, number of these were interviewed by telephone. A description of these activities is included in Appendix A (Section 4, pp. A-9, A-10; Section 5, pp. A-11, A-12, A-13, A-14), and a description of the problems encountered is included in Appendix A (Section 6, pp. A-15, A-16). A summary of information gathered during these interviews is included in Appendix B, and a report on a continuation of the literature survey is included in Appendix A (Section 4, p. A-9).

D. Third Stage

The third stage (two months duration) was to provide an analysis of the work of the previous two stages in the form of guidelines and a decision-model. During this stage would also occur a continuation of the literature search of the first stage and wrap-up of the interviewing of the second stage.

The preliminary analytical modeling accomplished prior to the third stage to provide a framework for interviewing has also provided a framework for the third stage. The nine factors which were developed (see Appendix B) proved, with some refinements, to be a stable and reasonably complete and balanced framework for collecting and aggregating the information received. While conceptually not intended to be mutually exclusive or inclusive, the factors appear capable of

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accounting for most (if not all) of the salient variables, and facilitate the process of networking (particular values of) those variables in specific applications. Because in this Final Report the major product of the third stage is included in Sections 3 and 4 below, no further description will be included here.

Activities during the third stage also included completion of the literature search begun in the first stage. The results of this effort appear in Appendix E which now includes a reasonably complete set of annotated references to the leader/follower process.

3. CATEGORIES AND GUIDELINES

A. Introduction

One of the two analytical products of the study was to "categorize the experiences surveyed and develop a series of guidelines that reflect those experiences." It was anticipated (but did not result) that there would be found a well-ordered set of preferred practices or procedures, defined within limitations of application, and confirmed by experience with problems encountered. Early in the study it was recognized that the leader/follower concept in practice included not only mutually exclusive sets of objectives, limitations, and methods but also strong interrelationships with a wide range of factors in the acquisition process. Because of this, and to facilitate the gathering of information, an analytical model was developed and refined throughout the study, organized around the nine factors (or issues or characteristics) listed in Appendix B. During the further analysis carried out in the third stage of the study, it became evident that these factors not only (fortuitously) provided the framework for the categories and guidelines but also, in the narrative content (in Appendix B) provided the substance of this product. For this reason, those factors will serve as the categories, and the guidelines will be presented in terms of a summary of the salient findings, in paragraph B below.

B. Guidelines

1) Objectives.

a) The objectives for which leader/follower may be appropriate include not only those specified in DAR 4-701 but variations or others requiring the development of second sources.

b) Whatever objective is identified will not necessarily be shared by all interested parties, and may be changed or modified during the course of the program.

c) The choice or applicability of objectives will be largely dependent upon the characteristics of the specific program.

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d) Underlying leader/follower are two proximal objectives-- establishing a second source, and facilitating the process through which the second source becomes able to effectively compete and/or produce.

e) One important objective in the use of leader/follower is to minimize the cost to the government of production quantities.

f) A second (and, usually, independent) objective is assurance of supply, either because of limited capacity of the original producer or to minimize uncertainties over an extended production period.

g) Commonality appears as an objective of leader/follower primarily where the decision to second source has been made to meet other objectives.

h) A variety of other objectives may appear, usually ancillary to the above.

2) Characteristics of the Procurement.

a) The size of the procurement, in terms of quantity of items, size of the individual item, and total dollars involved, is usually a critical determinant of the use of leader/follower, particularly in combination with considerations of time and the objectives chosen.

b) The relationship of the program to other programs may serve, in some cases, to facilitate leader/follower.

c) The technology involved in the program will determine, in conjunction with the characteristics of the potential second source, how difficult the process of transfer is, with extremes at either end militating against the use of leader/follower.

d) Divisibility of the program may either facilitate or provide and alternative to leader/follower.

e) Stability of the program is of critical importance, particularly in supporting early planning and implementation of leader/follower.

f) Visibility of the program may serve to facilitate (or impede) the effective use of leader/follower, depending upon the nature of the support the procuring agency receives.

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3) Reprourement Data Base.

a) Given a decision to second source (and some requirement for commonality), the state (or expected state) of the procurement data base provides the most likely indicator of the necessity for and/or desirability of using leader/follower.

b) The state of the reprourement data base varies with time, generally increasing in "goodness".

c) The highest state (of "goodness") of the reprourement data base is usually marked (and established) by a set of processes known as "proofing", but the state achieved may vary among programs.

d) The timing of leader/follower is dependent upon the timing of the increase in "goodness", and the efficiency and effectiveness is a function of the highest state achieved by the reprourement data base.

e) Conversely, leader/follower may bring about a higher state of the reprourement data base, providing spinoffs.

f) Where the government has not acquired rights in the data (and in some other cases), licensing may be required as a supplement (or alternate) to leader/follower.

g) The ability (and willingness) to achieve a "good" reprourement data base varies among industries (and companies) and with variations in technology as compared to the technological base.

4) Characteristics of (Potential) Contractors.

a) Except where the characteristics of the contractors provide the reason for developing a second source, consideration of leader/follower introduces, initially, few if any problems beyond those in a comparable procurement.

b) Whether the leader has already been selected or not may affect the ease of, and the methods used in, introducing leader/follower.

c) From an industry point of view, leader/follower appears, generally, to be just another "cost" of doing business with the government.

d) The (contractual) relationships outlined in DAR 4-703 represent only a part of the choices available to the government (and which may be available to industry).

5) Characteristics of the Procuring Agency.

a) It does not appear that any unusual requirements for administrative resources are introduced by leader/follower, apparently because the

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skills needed are among those available within the experience of competent procurement personnel.

b) Variations in the availability of technical resources may affect both the use and the method of use of leader/follower.

c) The organizational relationship of the procuring agency with program and other personnel, e.g., logistics elements, may affect both the use and the form of leader/follower.

d) Policy level decision makers can have a substantial facilitating (and limiting) effect upon leader/follower.

6) Relation Between Government and Contractors.

a) Availability and conditions for use of contract provisions to assure that the requisite assistance is provided (and accepted) appear to be similar to comparable contractual problems.

b) Provisions may include selection of the follower, mechanisms for measuring assistance provided, positive and negative financial incentives, testing and acceptance procedures, and award or prorating of subsequent production.

c) Direct or indirect control of choice of suppliers may be required to meet objectives of cost, assurance of supply, or commonality.

d) Where parallel production is required, both contractors may be in, essentially, "sole source" positions.

7) Time and/or Timing.

a) During planning, time appears as a factor primarily if coordination in aggregating requirements is necessary.

b) During the development to initial production period, time appears as a factor primarily if the initial producer has insufficient capacity.

c) The length of time between initial production and the end of production may largely determine the feasibility of, or necessity for, use of leader/follower to achieve objectives related to cost or assurance of supply.

d) When to introduce leader/follower is a function, in part, of the objective to be achieved.

8) Rules and Regulations.

a) The specified DAR provisions (4-701, 2, 3) apparently neither facilitate nor limit the use of leader/follower.

b) Other rules and regulations vary in applicability.

c) Where authority to negotiate is required, current practice

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appears to center on "3-216 Purchases in the Interest of National Defense or Industrial Mobilization."

9) Process and Methods.

a) The decision on whether or not to use leader/follower is a function of the previously listed factors.

b) The decision on when to use leader/follower is primarily a function of the objectives to be achieved, but early introduction is preferable if flexibility in commitment can be maintained.

c) The decision on what methods to use (and how to use them) is, in current practice, based more on broad experience and competence than on any special expertise.

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4. DECISION MODEL

A. Introduction

The decision model to be presented here is, in the words of the statement-of-work, to be used "... for applying the leader/follower concept to programs that involve acquisition of complex products and systems", and by "acquisition and contracting managers...". While a decision model could vary from the descriptive generalities of the present DAR provisions to an endlessly detailed branching algorithm, it appears that the most generally useful level of presentation would be in the form of a process description which identifies the factors associated with two decisions:

a) whether or not to use (or consider using) leader/follower; and b) how to use it. The level of supporting detail is a more difficult question because many, if not all, of the factors, and the process for evaluating them, are common to other decisions in the acquisition process, and thus within the present competence of acquisition and contracting managers. In the presentation here, detail will be provided to highlight the specific processes used in leader/follower, with some risk of cluttering up the process with the obvious, on the one hand, or oversimplification on the other.

The model is, basically, a sequential decision (flow) model, presenting the initial decision of "whether or not to use" in a series of steps keyed to critical factors, followed by the second decision of "how to use it" in outline form.

B. Overview of the Model

As is true with many, if not all, complex decision processes, the sequence of specific, detailed decisions may vary according to the individual decision maker and the specific circumstances, and may be iterative. For convenience in presentation, the model proposes a sequence which may represent a preferred practice but, in any event, provides a check list and a frame of reference.

The Overall Decision Model appears in graphical form in Figure 1. Each of the major decision steps is described in one or more paragraphs in this section, as follows:

Whether to Use

Preliminary Analysis

Second Source Decision

Paragraph C

Leader/follower Decision

Paragraph D

Detailed Analysis

Cost

Paragraph E

Availability

Paragraph F

"Other"

Paragraph G

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How to Use

Timing

Paragraph H

Form

Paragraph I

Incentive

Paragraph J

"Other"

Paragraph K

The notation in the boxes for the major steps is in three forms. First, in the boxes under "Preliminary Analysis", the references are all (except "Commonality") to the comparable factors as listed in Appendix B. Second, in the boxes under "Detailed Analysis" and "How to Use", the references are to specific objectives within the factor named "Objectives" as listed in Appendix B. Finally, the diamond shaped decision boxes identify the major decisions which control the process.

The initial point in the model, marked as START, assumes the existence of a specific decision maker (i.e., a specific acquisition or contracting manager) with some interest in considering the use of leader/follower for some specific program. The ending points in the model, marked as END, identify the several formal points at which use of the model may be terminated.

The first of the two basic decision areas, "Whether to Use", consists of two stages: first, a brief look, or "preliminary analysis", to determine whether or not the feasibility and/or desirability of leader/follower is sufficient to warrant a more extensive and detailed analysis; second, a "detailed analysis". The "preliminary analysis" is, itself, in two parts: first, an examination of (primarily) three factors to determine if development or establishment of a second source is feasible and/or desirable; second, an examination which includes three additional factors to determine if use of leader/follower is feasible and/or desirable. If warranted by the previous stage, a more "detailed analysis" is then carried out, depending upon which of several objectives is the primary purpose to be achieved.

The second basic decision area is "How to Use" leader/follower. This, again, will draw upon the previous analyses, and deals with key questions, including timing, form of contractual arrangements, incentives to assure the transfer of manufacturing assistance and know-how, and other considerations.

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C. Second Source Decision

The reason for considering the decision to second source first is that the issue of leader/follower doesn't arise unless there is the necessity for establishing a second source. In the early planning the decision on the number of sources to be developed may have been assumed or otherwise established; this may be a function of the nature of the procurement, e.g., small, one-shot buys, off-the-shelf commercial products, or of the assumptions and circumstances during the establishment of the program. Where the question has not been settled, the decision is likely to be sensitive to three interacting factors. The first factor is the presence of some objective which will be advanced (or which can only be achieved) by developing a second source; while there may be several objectives, the most likely ones are achievement of some advantage in the cost (of the production buy) and assurance of supply. These objectives are, in turn, sensitive to the second factor, the characteristics of the procurement, and, particularly, the size and the schedule. The third factor, time, enters in at least two ways: first, whether the time needed to develop a second source is available in the light of the previous two factors, and second, whether this decision is being considered early enough to allow introduction consistent with the time needed. There are other factors which may affect this decision, the most important of which is probably in the form of strong policy guidance.

D. Leader/follower Decision

If, and only if, the previous decision were to develop a second source, preliminary consideration of leader/follower becomes necessary. For purposes of this decision, three additional factors are of particular significance. The first factor, commonality, tends to be assumed, but is essential; if items to be procured from multiple sources are only required to meet minimal functional requirements, i.e., "form, fit, and function", there may be little or no necessity (and it may be, in fact, undesirable) to insist upon a transfer of manufacturing information from one producer to another. The second factor, the reprocurment data base, is probably the most critical determinant of the feasibility and/or desirability of leader/follower. If the available (or expected) data base is "so complete" that potential second sources can be expected to produce and/or compete without "extraordinary" assistance from the original developer/producer, there is no need for leader/follower; if, in contrast, the data base is so inadequate (or the product is so novel and difficult to produce) that the original developer/producer will be stretched to put it into production himself, leader/follower will not only be impractical (or infeasible) but may also interfere with the original production

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run. Only in the "middle area" where the second source can (only) be put in a position to produce and/or compete through "extraordinary assistance" is leader/follower indicated. This introduces the third factor, characteristics of (potential) contractors, the (potential) willingness and ability of the leader and the follower. Other factors or considerations may include use of alternative techniques such as breakout or directed licensing.

E. Detailed Analysis - Cost

If the preliminary analysis indicates the likelihood that use of leader/follower for development of a second source is feasible and desirable, the next stage is to examine the question in more detail, and, for this purpose, it is convenient to conduct the analysis on the basis of the specific (primary) objective under consideration.

The achievement of savings in the cost of the production quantities requires, essentially, a comparison of cost of sole source with cost of second (or two or multiple)sourcing. On one hand is the estimated cost saving to be obtained through price competition, usually on that part of the production buy which remains after the second source is able to produce and/or compete. On the other hand are those costs associated with establishing the second source--administrative costs to the government, cost of the services provided by the leader to the follower, start-up costs of the follower, i.e., an "educational buy". For programs with very large quantities and extended production runs, it is more likely that cost savings will be realized.

F. Detailed Analysis - Availability

The objective of availability (or assurance of supply) is probably the original and/or primary basis for the development of the second sourcing technique of leader/follower, i.e., the development or establishment of a mobilization base. In the absence of such a specific requirement, two other forms of availability appear. First, where the quantities scheduled exceed the present capability or capacity of a single producer, e.g., a shipyard; second, where circumstances are anticipated which may change or otherwise interfere with the developer/producer's ability (or willingness) to produce within the planned (or desired) parameters of performance, cost, and schedule throughout the duration of the program. Analysis of the first case may be relatively straightforward if the initial (or early) production schedule is clearly inconsistent with the capacity of a single producer; where the schedule buildup is consistent with leadtimes necessary to expand facilities and staff, an experienced

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and stable producer may well argue that availability is not an issue. The second case is more likely to involve "prudent judgment"--is the facility "vulnerable" to environmental assault or local labor conditions; is the producer capable of building up and maintaining the desired production rate; is management stable and responsible. In either case, the objective of availability essentially requires the establishment of more than one source as "sole source" and maintaining that condition over a period of time.

G. Detailed Analysis - "Other"

Each of the previous objectives may appear, to some degree, in conjunction with the other, or with any of several additional objectives. Where some objective other than cost or availability is the primary objective, the analysis may vary from very brief to extensive. Commonality, or an interest in improving the quality of the product, may involve detailed consideration not only of technical design options, but also the overall useful life of the product--operations, training, maintenance, logistics, life cycle costs, etc. Socio-economic objectives, e.g., participation by minority enterprises, and responding to policy directives to "increase competition" may require little or no analysis.

H. How to Use - Timing

Except where the option to continually reassess and discontinue is unavailable, it would appear that early consideration and planning is a dominant strategy; unless second sourcing and leader/follower are clearly inappropriate, early planning not only facilitates later use but also provides lead time to industry for its planning (and avoids surprise). In general, however, early planning may be difficult because of uncertainty concerning key factors.

Where the objective is cost savings, the actual introduction of leader/follower, i.e., designating a follower and directing the leader to provide assistance, may occur relatively late in the development-to-production phase of the leader. The later the introduction the more likely the design is stabilized and the data base available; the limit on delay is the necessity for having the follower capable of producing and/or competing while there are still significant production quantities remaining.

Where the objective is availability, it is usually necessary to initiate leader/follower at or near the beginning of the development. If capacity is the issue, it is an initial condition; if anticipated future conditions is the issue, delay increases the exposure and, in addition, may increase the difficulty of introduction.

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I. How to Use - Form

The form of contractual arrangement may be direct or indirect, and may vary during the several stages of the program. Where the objective is cost, the initial stage of establishing the second source may be carried out in any of several ways--through a subcontract from the leader to the follower, through separate prime contracts (with a contractual provision requiring the leader to provide assistance), or even a subcontract from the follower to the leader for assistance. During the competitive procurement stage, the form may be parallel prime contracts or a "winner-take-all" single prime contract. Where availability is the objective, any of the above forms may be used, but the maintenance of multiple sources over extended periods suggests the eventual use of parallel prime contracts.

J. How to Use - Incentives

A wide variety of incentives are available, depending upon the purpose to be achieved and upon the circumstances of the parties. The key, specific incentives are directed to assuring that the leader provides the requisite manufacturing assistance and know-how and that the follower accepts it. For the leader, in addition to recompense for his services, financial incentives may be tied to progress payments and to production delivery. Inspection, testing, and validation requirements can be used to determine whether the assistance has been successful, and various types of in-process review may be used.

K. How to Use - "Other"

Because leader/follower is a specialized technique within the overall procurement process, many methods and techniques may be applicable. Particularly where cost is a primary or secondary issue, cost containment methods will be applicable. Issues of commonality suggest the use of the extensive methods which apply even under sole source conditions.

Figure 1
OVERALL DECISION MODEL

WHETHER
TO USE

Preliminary Analysis

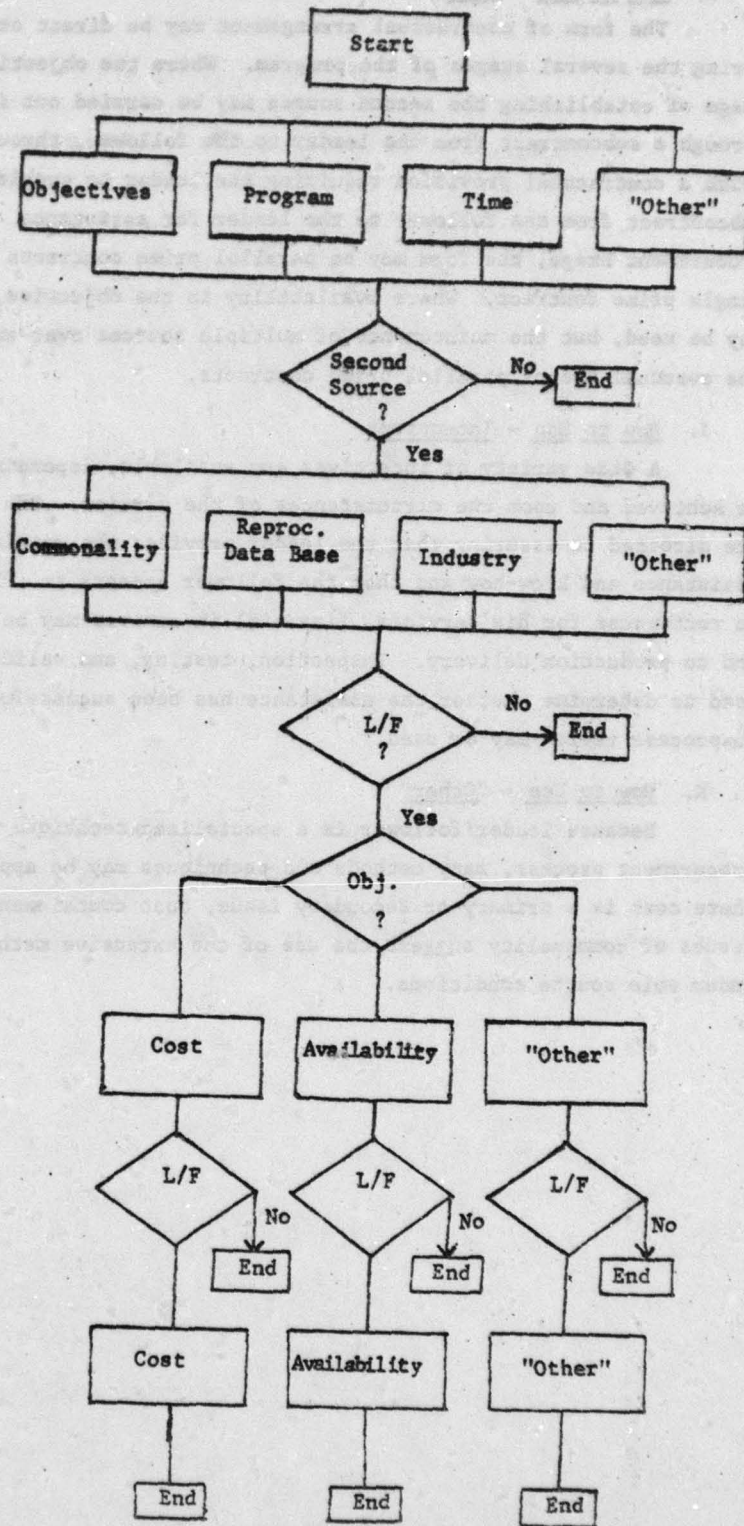
Second
Source
Decision

L/F
Decision

Detailed Analysis

HOW TO USE

Timing
Form
Incentive
Other



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5. TEST PLAN

A. Introduction

It was contemplated that a logical next step to follow this study would be "one or more experiments to test the decision model and guidance developed", and, for this purpose, a test plan was to be proposed. Testing, in this context, may serve one or both of two general purposes: first, to establish the validity (of the model and guidance); second, to evaluate (and/or improve) the process of application by acquisition and contracting managers.

The first purpose, testing validity, would be critical if the model and guidance reflected a choice among mutually inconsistent alternatives. During the course of the study, however, it became evident that strongly held differences of opinion on whether to use and how to use leader/follower are not characteristic, at least on the part of those with direct experience, when placed in context. For this reason, it is suggested that the test of validity presents few, if any, critical hypotheses whose confirmation would warrant any extended formal effort. The second purpose, to evaluate (and/or improve) the process of application, remains a viable, and potentially useful, continuing objective, and the plan outlined is directed to that purpose.

B. Test Plan

There are several experimental designs which may be applicable to test the general hypothesis that the model (and guidance) provides a feasible and useful framework for making decisions concerning the use of leader/follower. Practical experience with field experimentation, and, particularly, administrative experimentation (where concern for the objectives of the administrator is given equal attention), suggests that a series of one or more cooperative case studies is the most feasible approach.

In each case, an interested acquisition or contract manager is identified and requested to cooperate in a study of the feasibility and usefulness of the model. Because his cooperation is likely to follow his preliminary review of the model (and the supporting report), it will be necessary to obtain a "pretest" score of his understanding of the process retrospectively. Measures of his ability to easily apply the model can be obtained periodically (by self-report or by interview) during the process. These measures can include the following: clarity (was the form and language easy to understand and apply); completeness (did the model correctly identify, on a timely basis, key factors to consider, and how to consider);

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"tightness" (did the model avoid unnecessary or irrelevant steps); efficiency (how does the model compare to alternate forms of the model or alternate models); effectiveness (did the model contribute to, or impede, the achievement of a successful decision process).

The variety of different contexts, the variety of acquisition and contracting managers, and the variety in such a multipath model provide the opportunity for multiple, partially independent measures as well as a potentially rich input to refine the form and to improve the ease of application. The test process may be instrumented over a range from informal anecdotal reports to a formal set of protocols with in-process consultation and data gathering, the choice depending upon the importance of full documentation and the availability of resources.

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6. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

A. Summary

The major purpose of the study was to develop guidance for acquisition and contracting managers, and this is, properly, presented in the previous sections of the report. In this section will be presented a selection of key points which may be considered findings, conclusions, or recommendations.

B. Specific Findings

1) Leader/follower, in general

While the concept does not appear to be well (and widely) understood, those experienced in its use consider it to be just another technique, applicable for some purposes, under specific circumstances, and using, at most, variations on available methods.

2) Applicability of leader/follower

Leader/follower applies only where, first, a second source must be developed to accomplish some objective (usually related to cost savings or assurance of supply); and, second, it is both feasible and necessary to provide the second source with "extraordinary" manufacturing assistance and know-how from the original developer/producer.

3) Rules and regulations

The current DAR provision (4-701, 2, 3) neither facilitates nor impedes use of leader/follower. Incorporation of specific authorization to negotiate and/or develop second sources to meet explicit objectives (other than "mobilization base") should be considered, i.e., cost savings, assurance of supply, socio-economic. The form of this might be an addition to DAR 3-216.1 of words such as "...or (C) the interest in effecting specific procurement objectives requiring extraordinary efforts to establish additional sources.", and a new paragraph under DAR 3-216.2, as follows: "(viii) when procurement by negotiation is necessary to establish additional sources for any of the following purposes: to achieve cost savings through competitive reprocurement; to assure timely early delivery or to assure delivery over a sustained production period; to qualify minority or other disadvantaged companies." This language is, necessarily, offered only illustratively.

4) Policy direction

Policy direction can facilitate efficient and effective use of leader/follower by cognizant acquisition and contracting managers in three ways: first, early guidance on (and/or review of) specific objectives to be pursued on a specific program;

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second, early establishment of major program parameters (quantities, rate and duration of production, multi-year buys) to provide a stable planning base; third, delegation of operational discretion to respond to changing conditions by changes in the process or, if necessary, discontinuing use of leader/follower.

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APPENDIX A

REPORTS ON PLANS AND ACTIVITIES DURING FIRST AND SECOND STAGES

Note: This appendix consists of revised excerpts from the First and Second Technical Reports. Its purpose is to provide a more detailed description of the plans and activities of the first stages as previously reported. Revisions are primarily to correct typographical errors, provide minor updates, and to reflect pagination changes. Information from the previous reports not included here either appears elsewhere in the Final Report or was of transitory interest. In the following tabulation, the information in brackets references the original page numbers in the First (I) and Second (II) Technical Reports:

1. Data/Information Gathering Plan - General Description
(I, 2-4)..... A-1
2. Literature Search - Sources and Results During First
Stage (I, 5-6) A-4
3. Type of Information to be Gathered and the Data
Analysis Methods (I, 9-11) A-6
4. Summary of Activities in Second Stage
(II, 2-3) A-9
5. Methods for Data Gathering (II, 25-26) A-11
6. Problems Encountered (II, 29-30) A-15

Table 1 Preliminary List of Key Words and
Phrases in Leader/Follower Related
Literature and Usage (I, 12) A-17

Table 2 Sample Listing of Programs Which are
Reported to be Leader/Follower Type
Procurement (I, 14) A-18

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1. DATA/INFORMATION GATHERING PLAN - GENERAL DESCRIPTIONA. Introduction

As reflected in the Statement of Work, the data/information gathering process can be roughly divided into two stages - first, identification of sources (documents and individuals), and, second, obtaining relevant information from them.

It was anticipated that the identification of sources (documents and individuals) would be difficult for several reasons. First, leader company procurement (in the sense of ASPR 4-701) did not appear to have been documented in the form of either a review of past and present practice or any current official or comprehensive indexes. Second, the method is not only similar to a number of other methods but is also closely related to a number of major factors in procurement, e.g., provisions for obtaining procurement data. For these reasons a relatively complex search process was required.

The first stage-identification of sources (documents and individuals) - has largely been accomplished, and a brief description of the process will be provided in Sections B and C below. The data gathering plan for the second stage - obtaining relevant information from the sources - will be described in Section D below.

B. Identification of Documents Sources

A variety of search strategies were required and employed, using a combination of manual searches, machine searches, and personal contacts. In some cases the searches and contacts were accomplished personally through visits, telephone calls or uses of the mail; in other cases, particularly machine searches, access was achieved through the cooperation of others. A summary of the different types of searches is presented in the following paragraphs.

(1) Manual searches were carried out either through inspection of the actual document or through uses of indexes and abstracts, as follows:

(a) Periodicals. Issue by issue examination was made of (incomplete) collections of the Defense Industry Bulletin, Defense Management Journal, Air Force Magazine, Signal, Monthly List of GAO Reports, Program Managers Newsletter, and Government Contract Reports.

(b) Private Document Collections. Selected individual documents were examined and indexes were checked from two extensive collections: approximately 11,000 documents on research and development management in the Program on the Management of Research/Development (POMRAD) at Northwestern University and

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approximately 3,000 documents in a related collection of one of the project team members. In addition, documents collected by a member of APRO have been made available on loan.

(c) Collections and Indices. The holdings of the FAI library have been examined through the courtesy of the librarian and through examination of a series of special bibliographies which include abstracts. The ASPR Committee has agreed to make available the original files (Case 64-604) on the origin of ASPR 4-701, 702, 703. The OFFP has provided a draft copy of the proposed FAR provision. The holdings of the Chicago Bar Association library have been examined by shelf inspection and use of indices.

(d) Proceedings. Copies of the 6th, 7th, and 8th Acquisition Symposium Proceedings have been examined article by article. In addition, two other Proceedings have been examined in a similar fashion.

(e) Key Reports. A number of key reports have been examined for text references and bibliographies to identify potential sources.

(2) Machine Searches were carried out as follows:

(a) NTIS and Science Citation Index (Social). These searches were conducted using a partial selection of terms (and variations and combinations) from among those listed in Table 1, page A-17.

(b) FLITE. A search of FLITE has been requested, but the results are not yet available.

(c) DLSIE. Custom bibliographies were prepared using the terms "price competition" and "source selection."

(d) Federal Procurement Data Center. While the indexing system used cannot directly disclose relevant references, a special programming request has been made to identify potential offices, companies, and/or contracts.

(3) Personal Contacts have provided both leads to documents and, more critically, have facilitated access to documents identified through the above searches. Of particular importance, to date, have been individuals in the following organizations:

- Air Force Business Research Management Center
- Federal Acquisition Institute
- Army Logistics Management Center

C. Identification of Individuals

Personal Contacts have provided by far the major source for identifying programs, program offices, industrial organizations, and knowledgeable individuals

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with direct or indirect experience with leader/follower and related procurements.

D. Data Gathering Plan for Second Stage

Data gathering during the second stage will include obtaining information from both documents and individuals. As a continuation of the identification process in the first stage, additional documents and additional individuals will be identified, essentially using the process described in Sections B and C above. Individual documents (where available) will be read and, if relevant, abstracted and added to the present listing. Similarly, individuals identified will be added to prior lists.

The major data gathering, while continuing the identification and abstracting of documents, will be centered on obtaining information from knowledgeable individuals. In addition to obtaining copies of (or access to) relevant documents, information will be obtained by personal interviews, telephone calls, and mail questionnaires.

Because the apparent number of knowledgeable individuals (those identified plus the expected number of additional ones) appears to be much larger than can be individually interviewed within the limits of this modest study, a set of priorities must be imposed. The feasibility of direct contact with the identified program offices would indicate a first priority, and it is anticipated that a number of the program offices listed in Table 2 (p.A-18) will be visited for personal interviews.

It is anticipated that only a small number of industrial organizations will be visited personally, with priority given to those which are accessible (both geographically and in terms of cooperation).

For those which cannot be visited personally, and which represent potentially important inputs, a combination of telephone calls and mail questionnaires will be used to obtain coverage.

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2. LITERATURE SEARCH - SOURCES AND RESULTS DURING FIRST STAGEA. Summary of Results to Date

A total of 90 documents have been identified as relevant or potentially relevant to this study of the leader company procurement process. Of these, 52 have been read and abstracts prepared; an additional 38 documents have been identified from titles and abstracts as potentially relevant.

B. Sources

The 52 documents for which abstracts have been prepared have been categorized according to the type of sources as follows:

Government Publications	4
Government Reports	3
Non-government Reports	5
Conference Proceedings	20
Books	2
Theses	1
Professional Periodicals	12
News Magazines	4
News Releases	<u>1</u>
TOTAL	52

By making assumptions in a few cases, and not accounting for multiple authors, these sources include 28 government, 21 non-government, and 3 not identified authors.

C. Relevance

These sources have been separated into four categories for convenience in reference, as follows:

- (1) Direct references to leader-follower (or leader company procurement) and references to similar or closely related procurement methods.
- (2) References to factors interacting with or potentially affecting the use of leader/follower methods.
- (3) Historically significant references and tutorial or background references useful in establishing context.
- (4) References not yet in hand but which appear to be potentially relevant.

The 90 references are divided as follows:

Direct references	10
Interacting factors	21
Background references	21
Potentially relevant references	<u>38</u>
TOTAL	90

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Of the 52 sources which have been abstracted, only nine make explicit reference to leader/follower (or leader company procurement). Of these, only five are in the "direct reference" category - two references to the leader company regulation, a paper by Thorpe, an article by Clark, and a book by Sherman. Three of the remaining sources are limited references, and the last one is (apparently) a description of a different process. It is expected, however, that several of the other sources do include reference to leader/follower without, however, using that terminology.

D. Future Additions

The process of identifying and abstracting relevant documents is a continuing one, and it is expected that additional relevant documents will be added to the listing in this report. In some cases, this will come from searches underway but not completed, including the following:

- (1) Search being conducted by FLITE
- (2) Search being conducted by Federal Procurement Data Center
- (3) Search being conducted by FAI library
- (4) Review of ASPR Committee case file 64-604
- (5) Review of Acquisition Symposium Proceedings 1-5
- (6) Review of the 38 documents (paragraph C. 4, above) for which only abstracts are now available.

In addition, it is expected that further contacts, particularly with individuals and organizations actively engaged in leader/follower, will provide access or reference to additional documents - particularly, directives, guides, proposal and contract documentation, and other ephemeral sources.

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3. TYPE OF INFORMATION TO BE GATHERED AND THE DATA ANALYSIS METHODSA. Introduction

There are three separate, but related, types of information to be gathered, with different analytical requirements. These include: document sources; names of programs, program offices, industrial organizations, and knowledgeable individuals; substantive non-documentary information on leader company procurement and related factors. These will be treated separately in the sections below.

B. Document Sources

The types of documents to be gathered are represented by those listed in Appendix E. These include direct references to leader company procurement, interacting factors, and background references. It is anticipated that the major change will be a differential increase in program documents (policy directives, contractually related documentation, and ephemera). After screening, all relevant documents will be abstracted; however, further analysis will, in some cases, be accomplished for the final report.

C. Names and Addresses

Because of the difficulty encountered in this phase, it is believed that an up-to-date revision of Table 2, identifying programs, program offices, and industrial organizations actively engaged in leader company procurement or similar methods would be a useful by-product of this study for the acquisition community. A decision will be made later in the study of whether the resources are available for preparing this. The extent to which individuals will be identified is contingent on the need to assure confidentiality of sources.

D. Substantive Information on Leader/Follower

There are two different ways in which this information can be categorized. First, information on specific leader/follower procurements versus related and or aggregated (based on broad experience) information. Second, categorized according to how the information relates to the leader company procurement process. Each of these will be amplified below, after a brief description of background information which is considered relevant to both approaches.

For each individual source, we will attempt to collect background information to facilitate the analysis of the substantive information received. This will include, generally, the following: name; organization; address; telephone number; relation, if appropriate, to specific procurement (period of assignment, functions performed); relevant prior experience. In addition, confirmatory descriptive information, leads

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to other potentially relevant procurements, and leads to document sources will be requested. Information on "where or when" the data was collected will be added.

For specific leader/follower procurements, or similar specific procurements, information will be solicited using a combination of structured and open ended questions on the following:

(1) Objectives. Proposed and/or used; commentary on how they were identified, whether considered realistic (and complete) initially and later.

(2) Factors (or "decision criteria") contributing to or inhibiting the use of leader company procurement. Identified and/or considered; commentary on initial or subsequent experience with their effect.

(3) Process information ("how to"). Description of the specific methods used to initiate, plan, and carry out; commentary on success or failure; commentary on alternatives considered or might (or should) have been considered.

For individual sources not reporting on specific procurements, i.e., drawing upon either general past experience or current experience in anticipation of future involvement, similar questions can be used, but the form and detail can be varied in two ways. First, some sources will be particularly valuable in some particular area, e.g., validating procurement data, and the information can be more extensive on a limited subject. Second, for sources with broad experience, structured questions can be used to solicit opinions on a comprehensive set of potential objectives, factors, alternate methods, etc.

From an instrumentation point-of-view, a set of structured and open-ended interview protocol/questionnaires will be used. These will include the following:

(a) Background information on the source. Standard, pre-printed format with room for additional comments.

(b) Objectives. Two forms; one open-ended for the initial part of the "specific procurement" interview; a second form which will include a dimensional scale for each of the objectives in ASPR 4-701, plus variations and additional objectives collected from literature and other sources (including the separate or different objectives of involved industrial organizations). This will be used as a follow up on specific procurement interviews and for all others.

(c) Factors. Two forms; an open-ended one, as above; a second form which includes the factors in ASPR 4-702, plus variations and additional factors (including those separate factors of importance to involved industrial organizations).

(d) Process information. For specific procurements this will be in the form of a check list of process questions, e.g., how did you identify the follower,

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what contract process did you use. A separate and more extensive listing of alternative procedures will be used to structure information on the wide variety of detailed procedures which may be expected to appear. (The complementary processes of involved industrial organizations may also be included).

The preliminary analysis and presentation of data on specific leader/follower procurements is expected to be in the form of descriptive or summary tables. For information based on broad experience, or specific factors, a qualitative summary, with perhaps some quantitative aggregation, is expected to be the most responsible form the quality of the data will allow. The multitude of interacting factors and the wide variety of referent programs mitigates against formal analytical techniques.

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4. SUMMARY OF ACTIVITIES IN SECOND STAGEA. Literature

As noted in the First Report (p.A-5), the process of identifying and abstracting relevant documents is a continuing one, including followup on specific searches started during the previous stage, documents obtained during interviews, and other search processes.

Progress on previous specific searches (First Report, p.A-5) is as follows:

- (1) Two reports received from FLITE
- (2) The Federal Procurement Data Center search has been delayed for administrative reasons
- (3) No documents have been received, yet, from the FAI library
- (4) The ASPR Committee case file 64-604 has been reviewed and excerpts made; in addition, a copy of the predecessor AFPI provision was obtained
- (5) Acquisition Symposium Proceedings 1 through 5 have been reviewed, and eighteen articles have been abstracted
- (6) Twenty-five of the 38 potentially relevant documents listed in the First Report have been received and all have been abstracted.

Through the courtesy of individuals in the several procuring agencies visited, copies were obtained of excerpts from procurement documents, and these will be abstracted or otherwise referenced in the Final Report. Generally, it appears that specific contract or other procurement provisions are not considered either novel or of universal applicability, and an extended effort has not been made to obtain them. For example, provisions directing quantities to subcontractors, provisions for furnishing technical services, and the like are apparently straightforward contractual drafting tasks, given the decision they implement.

A number of other documents have been obtained, including some documents provided through the courtesy of others, and these and others will be abstracted and included in the Final Report.

B. Visits

As was anticipated (First Report, p.A-3), priority was given to visiting key procuring agencies. Of the ten programs identified in Table 2 (of the First Report), visits were made to five, and in two other cases, the key people were unavailable at the time of the visit. Contact with another program was accomplished by telephone. Of the ten programs, no effort to contact has been made with respect to only two--in one case at the specific request of the contact; in the other case because background information has not yet been obtained. In addition to visits to procuring agencies, visits were made to and interviews obtained with three

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industrial sources and a number of government sources not specific to any of the identified programs.

C. Telephone Interviews and Correspondence

Extended and extensive use has been made of telephone interviews. On a rough count, nearly 30 people have been interviewed at least once. In addition to in-person interviews, and counting multiple interviews, something in excess of twenty telephone interviews have been conducted; some very extended. The total number of calls is estimated to be well in excess of 100 at this time. Correspondence, up to this time, has been largely limited to formal requests for information or, in some cases, providing information on needs of the study, i.e., protocols. It is anticipated that telephone interviews will be conducted with two additional program offices and with five additional companies; where feasible and critical, additional contacts may be made.

D. Reporting

The preparation of this Second Report has been directed to meeting the requirements for the study. As noted elsewhere, updating the tasks in the first stage has continued and this will be included in the Final Report. Much of the information obtained will be of particular importance in the next stage, and will contribute to the Final Report.

The major reporting requirement is met by the extended summary description (in Appendix B, following). As anticipated in the First Report (pp. A-6 and 7), the organization and presentation of the voluminous information obtained can be in several forms. The choice of format used was based on several considerations: 1) to begin the transition to an issue format (based roughly on the protocol) which will contribute to the work of the next stage; 2) to facilitate an overview of variations and relations among the issues and/or characteristics which have been identified; and 3) to recognize that a series of case studies of individual programs was neither contemplated nor accomplished.

Each of the major issues (or characteristics, or factors) is treated sequentially, using a descriptive heading to generally identify the area. It should be clear that there are overlaps and interdependencies, not completely identified at this stage, and a lot of supporting information has necessarily been condensed and edited.

5. METHODS FOR DATA GATHERING

A. Planning

As was described in the First Report (p.A-3), the major data-gathering activity of this stage was "centered on obtaining information from knowledgeable individuals." During the previous stage, a number of key programs, individuals and issues had been identified, although it was clear that this would be an ongoing process throughout the study. Because of the number and complexity of the programs and issues, and the number of potential individual sources, it became clear that the resources available would allow no reasonably complete examination, and this did not even account for an already-evident potential large increase in numbers which could be added.

The sampling strategy to be used was in two steps. First, assign an initial priority to programs and program offices which appear to be significant (and available) sources. Second, compare the data obtained from them against the protocol to identify significant issues or gaps or areas which require coverage, and draw upon leads and suggestions as to important further sources; from these, assign priorities. This strategy, at this point in time, appears to have been an effective (and efficient) one.

The strategy, and time and resource constraints, dictated visits to major sources in Washington, Dayton and Huntsville. Contact with other sources was accomplished by telephone interviews, in some cases supplemented by mail.

The plan also included consideration of the analysis and synthesis which will be accomplished in the next stage. Preliminary analysis and synthesis, and comparison to the preliminary design of the final report, provides a check on which data should be given priority in the ongoing gathering process.

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B. Protocols

The term "protocols" is used here to include all of the various guides or outlines used by the researcher in gathering data. These can take many forms, can vary in completeness and/or detail, can be loosely or highly structured, can be formal or informal, and can be written or unwritten. Their usual purpose is to increase the likelihood that the information desired is gathered and/or to provide a format for the process of actual gathering of the data. Conventionally, the major forms of protocol are questionnaires or interview guides.

Because the present study is a broad, exploratory inquiry, rather than a detailed case study or confirmatory testing of some specific hypothesis, the protocol had to be wide ranging, open-ended, and highly adaptive. Its preparation began concurrently with initiation of the study. Extensive notes based upon literature review, relevant past experience and research with related phenomena, and initial discussions with government personnel were collected; from these were extracted (or organized) a series of check lists or interview guides which, in draft form, could be (and were) used in preparing for, and conducting, interviews.

It was intended (as noted in the First Report, p.A-7) that the protocol would be used not only for conducting interviews but also, in a modified form, for later followup and, in some cases, as a primary data gathering method, i.e., as a mailed questionnaire. For this purpose the set of questionnaires (including a cover letter) appearing in Appendix D was prepared. As will be discussed below, the development of a complete set of relatively structured questionnaires was discontinued, primarily because it became apparent that such a set would be neither feasible nor useful for purposes of the current study.

A corollary advantage of the protocol was realized in its use in organizing and analysing the data gathered and in assigning priorities in ongoing data gathering.

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C. Data Gathering

Except for the continued acquiring and abstracting of documents, the main form of data gathering was interviews, in person or by telephone. These were conducted in a relatively straightforward manner as outlined below.

The individual to be interviewed was identified, in most cases, through referral from a previously identified individual. At each initial contact, the interviewer identified himself, identified the person who had referred him, identified the sponsorship and purpose of the study, and indicated, generally, what kinds of information were desired. In all but a couple of cases, the interviewee either knew ahead of time that an inquiry was going to be made or "understood" immediately why he had been identified as a potential source. In a few cases, the identified source (or a secretary or assistant) was able to immediately suggest an alternate source who would be more "useful" for this purpose. In some cases, the alternate was interviewed, in others the initial source was interviewed, and in some cases, both. In none of these instances was there any indication that the first identified source was either "brushing off" the interviewer or trying to avoid responding.

Except in a few cases (where the source was opportunistically identified or was only indirectly related to the subject), all sources were open and cooperative. In most interviews, the source would take the interviewer's opening identifying remarks as the basis for describing the program and the several issues of interest. This willingness and indication of preference in the form of the interview precluded (as a matter of mutual choice) the use of the protocol as a formal method of organizing the interview. The protocol was present during the interview (whether in person or by telephone) and used to cross check for areas which might be overlooked. Usually, the interviewee would bring up a factor (or a series of factors) in his description, and questions or requests to amplify would be interjected to clarify or assure coverage of the point as outlined in the protocol. There were several major advantages to this adaptive and open-ended format: 1) the interviewee's willingness and cooperativeness was not dampened by the straightjacket weight of the protocol; 2) the interviewee's sense of the relative significance or importance of the factors or characteristics was obtained with minimum leading or contamination by the pre-conceived notions of the interviewer; 3) factors or characteristics which were overlooked or not sufficiently described in the protocol were uncovered; 4) protocol items which were not appropriate were avoided (and protocol items which were considered not appropriate but which were included; 5) less important protocol items were more easily passed over or set aside.

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In all cases, extensive contemporaneous notes were taken, and later coded against the protocol. In a few cases, copies of the written protocol (and copies of the First Report) were given to interviewees. In only a few cases were parts of questionnaires completed. It seems clear that completion of at least the main questionnaires would have provided additional information (and confirmatory information for points covered in the interview); it seems equally clear that much of this additional information would be of less significance (and this would be apparent to the interviewees who had already voluntarily provided the key information). Only if the study were directed to a comprehensive series of case studies would the additional expenditure (and imposition on the interviewees) be warranted.

It is expected that interviews will continue during the next phase, primarily in two areas: 1) specific followup with prior interviewees to clarify or confirm some critical point (some of these may be on the initiative of the interviewee); 2) additional interviews where some critical additional source or issue is identified.

Overall the data gathering stage is considered successful, primarily because of the knowledgeable cooperation of the interviewees. With a considerably longer period of time and more extensive resources, it would be possible to use the information received as an exploratory or pilot study and prepare a relatively complex and structured set of protocols and develop a much larger set of interviewees (and cover a much larger number of programs and issues). In terms of practical usefulness and the stated objectives of this exploratory study, it does not appear that this would be useful.

6. PROBLEMS ENCOUNTERED

As of this point, none of the problems encountered are considered to have significantly interfered with progress on the study. The kinds of "problems" encountered, whether anticipated or unexpected, and their immediate and expected effect, if any, on the overall study will be summarized briefly.

The first problem, which was anticipated prior to initiation of the project (and noted in the First Report, p.A-1), was the identification of sources (and programs). Our preliminary listing (Table 2) in the First Report of programs (as well as the other preliminary tables) includes several errors as well as omissions. It is expected that the errors will be corrected in the Final Report and some additional programs will be listed. The corollary problem of deciding which programs should be included (or excluded) is expected to be a continuing one. In addition to the few programs which are formally self-identified as using "leader/follower" and which substantially incorporate the process as contemplated by ASPR (DAR) 4-701, 2 and 3, there are programs which meet only one of these "tests", there are programs which are "potentially" leader/follower, there are programs extending back at least to World War II where leader/follower in the ASPR sense (if not name) was either used or was attempted, and there are significantly similar processes which have been used in a, probably, very large number of programs.

The second problem, and one not clearly anticipated, was the variety in use, a variety which makes comparisons inappropriate beyond the elements of second sourcing and directed technical assistance in transfer, both being characteristics common to many programs which would not ordinarily have any identification with leader/follower. The major effect of this development was the early termination of plans to use a formal and highly structured questionnaire as a backup survey instrument. The instrument on "objectives" in Appendix D illustrates this problem. Even if one can assume that all of the several potential objectives are properly identified, the set of possible respondents and any aggregation of their answers would provide largely uninterpretable results. Individuals associated with a successful winner-take-all buyout might properly ignore "assurance of supply." In contrast, a procuring agency centrally concerned with its vulnerability because of dependence on a single supplier might well consider cost savings to be a secondary issue. A separate and compounding problem is that, at this point, it appears that an intelligent assessment of the significance of a specific characteristic, e.g., technical complexity of the product, depends upon the context of other characteristics

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associated with the immediate program. This "problem" appears to be a fruitful one, suggesting the potential importance of the work which is planned for the third stage of this study.

In any study requiring interviews in the field, access to sources presents a potential problem. There were several problems with access. First, identification of sources, a problem which has been discussed elsewhere; the main effect has been to increase the time necessary to accomplish this task, and, and in some cases, preclude timely contact. The second problem of access was in initial contact by telephone; although summer vacations were expected to add delay, the major cause for difficulty here arises apparently out of the fact that these are very busy people--traveling, in committee meetings, on the telephone; and some offices apparently have an inadequate number of lines. This, again, adds time and cost to the process. A third access problem relates to classified information. It was anticipated that a current clearance would facilitate access, and the process was initiated. As of the present the clearance has not been received (although expected momentarily). The only known effects have been the additional work required to provide escorts at three facilities and the necessity for carefully extracting an unclassified excerpt from a classified document. It is probable, however, that additional documents and a fuller description of contextual characteristics would have been provided had the clearance been received. Whether this has significantly affected the study is problematical. The final access problem which was anticipated, was one of time and cost; only a limited number of sources could be visited, with a similar but less constrained limit on telephone contact.

Similar to access, the problem of cooperation is usually present in field studies, and this was anticipated, particularly with respect to industry sources because of the potential sensitivity of the information desired. It has been a delightful surprise to be overwhelmed with cooperation from both government and industry sources. Every substantive source has been extremely cooperative, in many cases taking the initiative in identifying key issues and other information important to the study. In many cases the interviewer was unable to accept offers of additional information and cooperation, and in most cases the interviewee volunteered to provide additional information. This cooperation may be due, in part, to the pride of professionals in their work, their interest in assuring that the study make a responsible contribution, and, perhaps, a reflection of the independent (unbiased) nature of the study and the interest and preparation of the interviewer.

TABLE 1

PRELIMINARY LIST OF KEY WORDS AND PHRASES
IN LEADER/FOLLOWER RELATED LITERATURE AND USAGE

Associate Contractor	Leader Company Procurement
Breakout	Leader/Follower
Company	Leader/Follower Procurement
Competition	Multiple Source
Competitive Procurement	Parallel Procurement
Competitive Reprocurement	Price Competition
Component Breakout	Prime Contracting
Contract	Preproduction
Contracting Out	Procurement
Co-Production Agreements	Production
Co-Procurement	Reprocurement
Directed Licensing	Second Source
Directed Technology Licensing	Sole Source
Dual Awards	Source
Dual Sourcing	Source Selection
Education Order	Split Buy
Educational Buy	Subcontracting
Follower	Team Contracting
Industrial Base	Technical Assistance
Joint Venture	Technology Licensing
Leader	Technology Transfer
Leader Company	Two Sources

NOTE: These terms and variations, e.g., contract, contracting, contractor, may be used in various combinations, depending upon the retrieval capabilities of various indexing systems.

NOTE: This version of the table which appeared in the First Technical Report as Table 1 has been revised to include "usage" in the title and by the addition of the last entry.

TABLE 2

SAMPLE LISTING OF PROGRAMS WHICH ARE REPORTED TO BE LEADER/FOLLOWER TYPE PROCUREMENT

<u>Program</u>	<u>Program Office</u>	<u>Leader Company</u>	<u>Follower Company</u>
ACES II Ejection Seat	Aeronautical Systems Division WPAFB, OH	Douglas Aircraft	Weber Aircraft Company
TOW Missile System	U.S. Army Missile Material Readiness Command Huntsville, AL	Hughes Aircraft	Chrysler Corporation
Dragon Missile System	U.S. Army Missile Material Readiness Command Huntsville, AL	McDonnell Douglas	Raytheon Company; Kollsman Instrument
Shillelagh Missile System	U.S. Army Missile Material Readiness Command Huntsville, AL	Philco-Ford	Martin-Marietta
Cruise Missile Motor	Joint Cruise Missile Project Office, Crystal City Alexandria, VA	Williams Research	Teledyne
Cruise Missile	Joint Cruise Missile Project Office, Crystal City Alexandria, VA	General Dynamics Boeing Aircraft	
Ground Position Satellite System	Space and Missiles Systems Organization Los Angeles, CA	UNK.	UNK.
Advanced Self-Protect Jammer	Naval Air Systems Command, Crystal City, Alexandria, VA	Sanders Associates; Northrop ITT; Westinghouse AIL; Raytheon and others	Same Same Same

NOTE: The original version of this table which appeared in the First Technical Report as Table 3 has been revised to include corrections and by deletion of programs which are either inapplicable or for which significant information was not obtained.

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APPENDIX B

KEY FACTORS INVOLVED IN THE LEADER/FOLLOWER PROCESS

Note: This appendix is a revision of the extended summary description which appeared in the Second Technical Report. It is based primarily on the extensive interviews with personnel in government procurement and in industry but also draws upon other sources, such as the literature listed in Appendix E. It is organized in the form of major issues (or characteristics, or factors), as follows:

1. Objectives B-1
2. Characteristics of the Procurement..... B-4
3. Reprocurement Data Base B-7
4. Characteristics of (Potential) Contractors. B-10
5. Characteristics of Procuring Agency B-13
6. Relation Between Government and Contractors B-15
7. Time and/or Timing B-17
8. Rules and Regulations B-19
9. Process and Methods B-21

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1. OBJECTIVES

In a nominal sense, ASPR (DAR) 4-701 provides a listing of objectives, one or more of which may be viewed as suggesting or justifying the use of leader/follower. With some rephrasing and interpretation it may be possible to consider this listing definitive, at least for the "objectives" which are considered initially by the procuring agency. Any discussion of objectives, however, is considerably more complex than this. The initial objectives of the procuring agency may appear in any of these variations: 1) the stated objective for the record may be different from the "real" objective; 2) there may be a single objective, a set of interrelated objectives, or a set of independent objectives; 3) objectives may be of equal or different weight; 4) different individuals or organizational elements may share or may differ on objectives. Over time these objectives may change, or may be modified to meet changes in circumstances or requirements from higher echelons. Finally, these objectives may not include objectives of industry, other decision makers, or stakeholders, and they may not include other objectives which may be affected by unintended (or unwanted) spinoffs or side effects from the use of leader/follower. These types of considerations appear pervasively in discussions with experienced individuals:

The most important observation about objectives is that they have little meaning out of context, and particularly in the absence of identification of specific programs. While many, if not all, of the ASPR objectives have a universal "motherhood and apple pie" type of desirability, in most if not all cases, the importance or significance and applicability of a specific objective is likely to be dependent upon other factors, and particularly the nature of the procurement. Significant cost savings generally require a large volume, long production run with sufficient lead time to qualify a second source; shortening the time for delivery may be a critical objective only where no single company has or can acquire sufficient capacity; and similar descriptions can be applied to other objectives.

From an analytical point of view, all of the several objectives can be subsumed as requiring the achievement of a more proximal or intermediate objective--establishing a second source. If there is any underlying objective in leader/follower, it is to establish a second source. Further, what makes leader/follower different, if at all, from other second sourcing methods is that it is a technique to achieve a more specific objective--facilitate the process through which a second source becomes

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able to effectively compete and/or produce.

In current or recent practice, there are several objectives which appear to be of considerable importance. First, but not necessarily in importance, are objectives related to cost. One form appears where the program is sufficiently well defined and includes relatively large quantities over an extended production period. With time to stabilize the product and to develop and establish a second source, it was considered feasible to obtain effective price competition on a large remaining quantity on a winner-take-all buyout. Assurance of commonality, to varying degrees, is an additional objective to be realized. Other objectives, such as assurance of supply or maintaining a production base (in the future) do not appear to be significant. Two additional objectives which were (or could be) achieved are improvements in the quality of the product and meeting socio-economic objectives in the area of facilitating participation by disadvantaged enterprises.

Cost may appear in several other forms. Where, for other reasons, multiple sources are required or anticipated, leader/follower may minimize the front-end costs of second sources. More generally, the presence or potential presence of a competitor is considered to serve as a cost containment factor, particularly in the later stages of the procurement cycle. Where assurance of supply is also a factor (or objective), avoidance of costs associated with or growing out of delays in reprourement and with start-up may be realized.

Assurance of supply appears to be a second significant objective. This is sometimes closely related to assuring "early" delivery and to the various meanings of mobilization base. In the simplest sense, the objective is to avoid dependence upon a single source of supply. Voluntary or involuntary decreases in the capability of a sole source to meet requirements may result in interruptions or delays in delivery (or changes in cost and quality). "Early" delivery is more likely to relate to limitations on the capacity of the primary producer; mobilization base relates usually, to the ability to respond to significant increases in demand. To some extent this objective interacts with cost and commonality.

Commonality is a generic term for a variety of related objectives. Most generally, the objective is to ensure that all of the items procured to perform a specific function will not only perform the function interchangeably but are also interchangeable (or identical) for a number of logistics purposes. This may simplify training, operation, support, may improve performance, and may effect cost savings. Where this is the primary objective, second sourcing might, itself, not be preferred;

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only if second sourcing is required for other purposes or is otherwise anticipated would this objective suggest leader/follower.

A number of other objectives appear. At least in the later stages, there may be interest in using leader/follower as a "test case" or an interest in "proving" that it is a feasible and valuable technique. One of the often unintended objectives which is realized is an improvement in the TDP (technical data package) and in the quality of the product. A related objective is to "increase competition," or to increase the use of advertised over negotiated procurement. More generally, there may be a strong interest in extending the period of "competition" throughout the life of the program to achieve various combinations of the above objectives. Finally, the use of leader/follower may facilitate the socio-economic objective of increasing participation by minority-owned or other disadvantaged firms, particularly where special technical assistance is necessary to enable them to produce and/or compete.

It should be observed that the feasibility of achieving these objectives in a particular case, or the degree of achievement, is not necessarily clear. In addition, there may be disagreements on how the objective is to be defined and on what are appropriate measures to use.

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2. CHARACTERISTICS OF THE PROCUREMENT

There are several characteristics of the procurement which, in conjunction with other factors, particularly objectives, facilitate or limit the use of leader/follower. However, it does not appear that any single characteristic, standing alone, would dictate use or non-use of leader/follower. For convenience in discussion, the characteristics will be presented in five categories.

The first category includes those characteristics which are related to the size of the procurement. Quantity of items to be procured is, perhaps, the most obvious form. Very large numbers, particularly over an extended production (and use) period, suggest the potential for cost savings through development of a second source and competing. Large numbers, however, may not provide a cost advantage if the unit price is very low compared with the cost of developing the second source. Conversely, for very large items and a tight delivery schedule, relatively small quantities may justify or require the use of leader/follower. This introduces a second characteristic of size, the size of the individual item, e.g., a ship as compared to an ammunition round. Combining size of the individual item with the total quantity of items results in a third size characteristic, the total dollars involved. Total dollars in the program will affect the willingness of the procuring agency (and industry) to devote resources and attention to developing and using "extraordinary measures."

The second category includes the relationships of the procurement or program to other programs, both competitive and cooperative. From a mission-requirements point of view, a program may range from one of many competing programs to, essentially, a "sole source" to meet the requirement. If the program is in competition with alternative programs, leader/follower may provide a competitive margin in one of several ways: 1) assurance of supply, either in meeting critical delivery requirements or in maintaining an inventory position over an extended period; 2) prospects for cost containment and/or minimizing overall cost; 3) prospects for obtaining the "best" initial performance, for early proofing of procurement data, and for achieving commonality to minimize logistics costs through the addition of the follower's engineering and production resources to those of the leader. Conversely, a competitive position may preclude the introduction of the additional burden of developing a second source.

Where the program is, itself, in a "sole source" position, it would appear that the effect upon the use of leader/follower

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is similar to that which arises out of the relationship of the program to other, cooperative programs. Cooperative programs (or programs which are not directly competitive) are of two kinds. First, programs where there is a performance (and time) interface. Where the program provides a component which becomes part of another program, e.g., high technology ejection seat, the other program may introduce performance, time, or cost requirements which may either facilitate or limit the use of leader/follower. Second, there are programs in a more general sense, e.g., logistics, training, maintenance, cost containment, maintaining or encouraging competition, which may suggest or require the use of leader/follower.

The third category relates to technology, and, particularly, high technology. There appear to be at least two different technology-related characteristics: first, how "high" the technology is, and, second, to what degree the technology is "divisible." "High technology" is not, in this context, a simple, abstract metric. The characteristic of the technology which is used which affects leader/follower is the difficulty in transferring the technology to a second producer. In the extreme case of a technology so new and difficult and complex that the developer is hard pressed to put it into production himself, leader/follower may delay initial production and may not, in addition, achieve, within practical limits, time and cost objectives. In other cases, there may be several suppliers in a high technology area who are capable of producing based upon available procurement data and "reverse engineering." It would appear that leader/follower is primarily applicable in a "middle area" where active assistance from the leader to the follower can, in comparison to no assistance, accomplish one or more of the following: 1) decrease the time to production for the follower; 2) decrease the front end costs to the follower; 3) decrease or eliminate differences in performance and/or design; 4) increase the ability of the follower to price competitively.

The second technology characteristic relates to divisibility, and this takes several forms. Within a program, different items may be required in greatly varying quantities; for example, a satellite communication system may require a small number of satellites and a very large number of ground (or user) stations. If the technology is such that the interface can be specified, it may be possible to "breakout" one part for leader/follower. More generally, the capability to "breakout" is, itself, a potential form of second sourcing, whether using leader/follower or not. If capacity to meet schedules or assurance of supply is the objective, second sourcing at the prime level will not necessarily meet the objective if common subcontractors are used; conversely, second-sourcing key subcontractors may achieve

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these objectives with a sole prime source. Divisibility of the technology must also be considered with respect to the various stages of the development, test, production, and use process. Concepts associated with terms such as "wooden rounds" and "black box" enter here. If performance interface is the only requirement, e.g., ammunition, the use of leader/follower may be limited to interface specification and testing. If, however, maintenance or repairability (or other logistics requirements) dictate commonality within the "black box", a much greater level of leader/follower assistance may be required.

The fourth category relates to stability. Early establishment of program requirements and reasonable continuity during the phases, at least up until production is established, increases the ability to assess the applicability of leader/follower and, where indicated, to introduce it into the program plan. This appears to be particularly true with respect to quantities to be produced and delivery schedules. Fluctuations in quantities or delivery schedules may make it difficult to estimate potential cost savings (the difference between cost of establishing a second source and the cost advantage of competitive production procurement) or to introduce leader/follower early enough to meet schedules. More, generally, industry interest in a program and its ability to plan its participation is affected, in part, by expectations as to whether the quantity to be procured will be sufficient to offset its participation in the development as a leader (and, in some cases, as a follower).

The fifth, and last, category relates to importance or visibility. This characteristic is, to some extent, a function of other characteristics, particularly program size; however, a relatively small program may have high visibility because it represents an exciting technology, is a critical component of other programs, or has attracted attention from some important decision-maker or stakeholder. Assurance of supply of some critical component necessary to the operation of a major system may require the development of a second source even where there may be reasonable differences of opinion on the risk. Consideration (or initiation) of leader/follower may attract attention and create a new "objective", making the procurement into a "test case" of leader/follower. It appears, at least in some cases, that program managers prefer to avoid visibility during the planning and implementation of leader/follower in order to maintain some flexibility and to prevent premature evaluation. During the early stages, where there may be some uncertainty about feasibility or the outcome, neither government nor industry personnel are interested in prejudging.

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3. REPROCUREMENT DATA BASE

If there is one single characteristic (given a decision to establish a second source) which determines the use (or non-use) of leader/follower, the reprocurement data base is the most likely candidate. If there is (or is expected to be) a reprocurement data base, or technical data package (TDP), sufficiently complete to allow a second source to effectively compete and/or produce, the "extraordinary" method of leader/follower is unnecessary. If, at the other extreme, the TDP is so difficult and complex to produce that even the assistance of the developer will not provide sufficient information for effective competition and/or production by a second source, leader/follower will be ineffective. Only where assistance from the developer-producer (leader) is needed to supplement the TDP and will (or is expected to) enable the follower to compete and/or produce effectively is leader/follower necessary and/or desirable. It should be noted that the conditions under which the above statements are applicable vary according to the objectives to be obtained and, in most cases, according to a number of other factors. For example to achieve cost savings, the ability of the second source to compete is as critical as his ability to produce. To ensure commonality, the ability of the second source to produce an identical item is critical. And to achieve assurance of supply, only the ability to produce by the second source is critical. Similarly, the completeness of the TDP may be a function of the technology involved, the ability of the developer to produce the TDP, the willingness of the developer (and/or the ability of the procuring agency to compel him to do so), and the capability of the second source.

It has been suggested that a "good" TDP must be available to use leader/follower. While it has not been determined what this means, there are several possible interpretations. If the developer has not stabilized his design, i.e., he is still developing the item, or he is still making changes to improve its producibility, or he has not converted his engineering or shop drawings into a form intelligible (and/or available) to others, attempts to provide assistance to a second producer may be premature. The concept of "proofing" the TDP is used to mark the point (if there is such a point) where the design is stable and is represented by a "good" TDP. Proofing may take several forms: 1) parts from which the TDP was produced can be tested for serviceability, maintainability, etc., and against various specifications; 2) parts can be produced, using the TDP, and tested and examined as above; 3) the leader and the follower can exchange parts, TDP, and testing to see if any of the three produce different results. The whole area of proofing the TDP is of sufficient importance that there are programs and processes directed to this which provide a

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base or reference point for the special problems introduced by leader/follower. This may also reflect a special concern with assuring that the production item (whether original or second source) meets all of the government's requirements. One way of increasing this assurance is the taking control by the government of configuration management and the data package. If second sourcing occurs after this point, it is less likely that further changes will be required (or precluded).

An interesting effect of leader/follower on the quality of the TDP (as distinguished by the obverse) is that, at least sometimes, leader/follower results in a better TDP. The original producer may find it unnecessary to develop a complete TDP in order to produce; the second producer, however, ordinarily finds it necessary to discover the errors and omissions and, in this way, it is possible to achieve a "clean" or "good" TDP which can be used by a third source, or others who have use for the TDP. Achievement of a "good" TDP may serve purposes other than reprourement. The TDP, or parts of it, may be used for various logistics purposes--provisioning, maintenance, inventory, training, etc. As distinguished from establishing second sources to meet program requirements, a good TDP may advance socio-economic objectives through facilitating qualification of minority or other disadvantaged companies.

Related to TDP is the separate question of: rights in data, proprietary data and rights, and the like. Where the government has obtained rights in the TDP there may still remain questions concerning shop rights and proprietary processes or knowhow. Even where there is no question of ownership, the developer may be either unwilling or unable to incorporate all of the necessary technical information in the TDP. A related problem is timing; even if the developer is willing and able to incorporate all of the information into the TDP, he may not be able to accomplish it in time for use by the second source. Where the TDP does include (or would be required to include to be complete) proprietary data (or knowhow), provisions for assistance (as required by leader/follower) will need to include not only recompense for the time and effort expended but also for the value of the proprietary information provided. This is, conventionally, a matter of licensing which may be considered either an alternate to or an alternative form of leader/follower.

In general, the transfer of technical data from leader to follower may range from a very difficult (or impossible) problem to a normal business practice. In some industries, such as major air weapons systems, transfer of technology to and from subcontractors is a normal incident of the business and may present no unusual problems

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in accomplishment (although the imposition of the requirement and the implication for future competitive reprocurement may introduce problems). In some high technology areas, particularly where market uncertainties have resulted in a very thin technology base, there may be no more than one company capable of developing and producing a particular item without a long learning and buildup period.

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4. CHARACTERISTICS OF (POTENTIAL) CONTRACTORS

This characteristic apparently presents few initial problems in considering whether to use leader/follower, but is considered an important characteristic and, during the course of carrying out a leader/follower, these characteristics may become critical. Except where the characteristics of a potential (or present) source provide the reason for using leader/follower, the characteristics desired (or required) in potential leaders (and followers) are apparently not considered significantly different from those which are required in comparable non-leader procurements--interest in and capability of developing and producing.

In any procurement of such size or potential significance to warrant the consideration of leader/follower, there is apparently no point so early that industry interest in the procurement has not already resulted in a pool of potentially available leaders and followers. This "availability" does not necessarily continue, however, throughout the life of the program. Particularly in the later stages of the program, unless there is a significant production quantity remaining, it may be difficult to obtain the interest of a follower. The provisions of ASPR (DAR) 4-702 (i) that the leader possess the "necessary know-how" and be able to furnish "the requisite assistance" would seem to be an anomaly. Normally, the contractor (whether sole source or leader) does not possess the know-how until well under contract, and his ability to provide assistance, except in extreme cases, will be largely indeterminate until after the fact. It would appear that the set of potential sources (leader and follower) necessary for leader/follower is not, as a practical matter, distinguishable from the set necessary for any comparable competitive procurement (including one where it is contemplated that the winner will then become a "sole source").

Where the introduction of leader/follower is being considered at a time when the leader (and, more rarely, the follower) is already identified, contractor characteristics may be more critical. It is apparent, at least in most cases, that the contractor who has won (or otherwise obtained) the original development (or development-production) contract has some reasonable expectation that he has also "won" the initial production or, at least, an advantage (in terms of ability to deliver, cost to produce, and ability to cost) over potential competitors. To impose upon him a requirement that he assist a competitor is changing the rules in the middle of the game. Incentives of pride and profit from one's own product conflict with incentives growing out of the need to "beat" a competitor. In

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contrast, the problem of obtaining followers is, if anything, lessened under leader/follower by the prospects of additional assistance in getting into production.

The objectives of industry, and particularly those which may be affected by being a leader or a follower, are important characteristics but difficult or risky to generalize about. Conventionally, industry decision makers are preoccupied with the "bottom line" - making a profit. This is, obviously, an oversimplification. Profit on the immediate contract, in terms of the decision to bid or in terms of decisions during the life of the contract, may be less important than profits on the subsequent contract, particularly where the immediate contract is for development or initial production. Similarly, short-term objectives to make use of unused capacity (either personnel or facilities) or longer-term objectives of growth, development of product lines, or entry into new lines, may be of greater importance. Different decision makers, particularly those who differ in their relationship to a specific program, can be expected to vary considerably in their opinions with respect to the effect of leader/follower.

While it is difficult to speak with confidence, based upon a small sample and a limited interchange, it appears to be the general impression of contractor program personnel that leader/follower, where introduced, is just another "cost" of doing business, just another condition imposed by the customer to meet some important or other need. During the early stages there appear to be few if any noticeable specific effects upon the leader other than anticipation of possible difficulties in transfer and loss of production volume.

Another characteristic is the nature of the relationships between leader and follower. In addition to the several relationships outlined in ASPR (DAR) 4-703-1) prime to leader, with subcontract to follower; 2) prime to leader for assistance and prime to follower for production, and 3) prime to follower with subcontract to leader for assistance--there are variations of interest.

Assistance may be a provision of the leader's production contract; assistance may be a provision more implied than express where the prime contractor is required to demonstrate that his subcontractor for a specified item can produce acceptable items. Where two or more contractors comprise a "team" (usually with one acting as prime) a requirement to demonstrate that each is capable of independent production similarly implies assistance. In addition to these contractually imposed relationships, each contractor may have prior or continuing relationships with the program or with each other. With respect to the program, either one or both may have been involved in earlier stages of development. This can take several forms: 1) sole original

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developer, 2) competitive developers on the same program, 3) developers on separate competitive programs, 4) developer (and/or producer) on the immediate preceding program which is intended to be superceded when this program is successful. In addition to these separate (and competitive) relationships, the contractors may have had cooperative relationships (e.g., one as subcontractor to the other) on the program, or on other programs; they may share or draw upon common suppliers for key components; or they may even have other contractual or corporate interrelationships. The nature of these prior relationships may affect accomplishment of specific objectives, e.g., assurance of supply or competition in pricing could be substantially diminished if leader and follower use the same suppliers. An intense and sustained competition may make it difficult for leader engineering personnel to share their design or for follower engineering personnel to accept the leader's design work, in spite of management willingness. Whether different divisions of a corporation can provide the advantages expected from cost competition or assurance of supply depends upon the degree of independence which actually exists.

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5. CHARACTERISTICS OF PROCURING AGENCY

The term "procuring agency" in a generic sense may describe any one or more of several organizational elements. For our purposes we shall distinguish between the individuals (and/or organizational element(s)) directly concerned with initiation and carrying out of leader/follower and other decision makers or stakeholders. In this context, it appears that the characteristics of interest can be categorized as follows: administrative and technical resources; relations with other decision makers and stakeholders.

The administrative resources may be characterized in terms of familiarity with and capability to introduce leader/follower. It is not clear how this characteristic affects use of leader/follower. Most, if not all, of the procuring agency personnel contacted either had extensive relevant experience or perceived that the lack of experience with leader/follower was not a disadvantage. In some cases, experience with the leader/follower (or substantially similar processes) went back to World War II or the period following. The objectives of second sourcing and the various means of "encouraging" the original developer-producer to cooperate with second sources appear to be part of the general background of experienced procurement personnel. The absence of formal guidance beyond the nominal listings in the ASPR (DAR) does not appear to have been a deterrent. Similarly, it does not appear that the additional work involved in carrying out leader/follower is considered to add a significant workload, although this may be a difficult matter of judgment. Where leader/follower is, or has been, used to meet a specific objective and is considered to have worked well, the agency is (and expectedly so) confident of its knowledge and ability to use leader/follower when and if a future opportunity arises. Those agencies which are in the early stages (and/or where the outcome is yet in doubt) vary from confidence that their resources are adequate to a position of considerable interest in knowing more about the process. Except for those agencies with a specific, specialized interest in the process, it does appear that there is a gap between what is known and what is "needed". The great variety in objectives, in factors facilitating and limiting, and in methods used makes it unlikely that any single procuring agency has been either interested in or experienced with the process overall.

The technical resources available to the procuring agency have a differential impact on leader/follower. If the technical resources are limited, leader/follower may provide the only available means for developing and proofing reprourement data and

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qualifying a second source; where there are adequate technical resources, there may be a strong preference to carry out the proofing and to qualify the second source within the agency, primarily to assure that agency requirements (for standardization, commonality, etc.) are achieved. If the method chosen for leader/follower assures that the contractor (usually the leader) carries out the technical tasks, the burden on the agency becomes minimal; if it does not, either because the method doesn't require contractor performance or doesn't obtain it, the technical resources of the agency have the additional burden of dealing with a second contractor (or producer).

In some cases, there are decision makers within the procuring agency, other than those directly concerned with leader/follower processes, whose interests must be considered. Program managers, either of the immediate program or closely related programs, are likely to be concerned with obtaining the equipment they need with a minimum of distraction or interference. From their point of view, dollars spent on reprourement data or on developing second sources could be better spent to buy additional equipments. Delays in production, and problems with qualification, introduced by second sourcing are more immediate concerns than long range (and/or conjectural) cost savings (or assurance of supply). Program managers are inclined to favor a single point of responsibility, preferring, in the extreme, that the systems contractor worry about all of the technical, cost, and scheduling problems.

Depending upon the organization of the procuring agency, the interests of operating and logistics elements may either facilitate or limit the use of leader/follower. Where commonality is important, a sole source, conventionally, provides the highest degree of assurance. If second sourcing is required for other reasons, assurance of commonality may require leader/follower.

Policy level decision makers in the procuring agency (or in echelons above it) may have a significant impact on the leader/follower process. A strong policy interest in competitive reprourement (or, more particularly, a strong policy interest in demonstrating the use of leader/follower) may provide the opportunity for (and the support required to carry out a) leader/follower. Under other circumstances, and particularly after the initial stages have been started, a strong policy interest may require continuation even though circumstances have changed or the feasibility of achieving the objectives has diminished.

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6. RELATION BETWEEN GOVERNMENT AND CONTRACTORS

A variety of direct and indirect contract relations may be used between the government and the contractors, including the forms specified in ASPR (DAR) 4-703. Similarly, a wide variety of contract provisions may be employed to assure that the requisite assistance is provided (and used). The choice of contract relationship and supporting provisions is, to a large degree, dependent upon the position of the parties: prior to establishing the relationship, at the time of establishing the relationship, and the expectations concerning future relationships. Because for most, if not all, of the product lines involved the procuring agency (or the government, more generally) represents the only significant buyer (and, for many firms, bears the same relationship to other product lines), the government is usually in a position to choose which contract forms and provisions it wishes to use.

Where the prospective leader company has already established its capability to develop and produce, the government may find its options limited. For example, if the company has developed the capability in part or all as a proprietary position, provisions to recompense the company through licensing instead of payment for assistance only will be required. Where proprietary rights are not at issue, the government may not only have to pay for the assistance but also defray start up costs of the second source, such as through an "educational buy", and accept delays in delivery.

Where the prospective leader company has not established its capability to develop and produce, provisions for leader/follower may be incorporated as a requirement or an option in the RFP for development (or development-production). The form that this takes, and the degree of implementation, is dependent upon a number of things. If a single award is made for development (or development-production), the absence of effective continuing or subsequent competition suggests the importance a greater degree of specification and implementation. Provisions for selection of the follower (either by the leader or the procuring agency) need to be made, and mechanisms for ensuring that an effective and timely provision of assistance is accomplished must be provided. Various types of incentives may be used, including incentive fees, withholding of progress payments, and changes in share of production. Various measures and milestones may be used to monitor progress in providing assistance, and the effectiveness in establishing the follower as a second source may be measured by a variety of testing and acceptance provisions. If the leader is directed to subcontract certain quantities to the follower, he may also be

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required to assure that the follower's production is acceptable, and to perform the acceptance tests. Where the follower is under a separate prime contract, acceptance by the government may be against the TDP, with further proof testing in use as a measure of the success of the assistance.

If more than one award is made for development (or development-production), leader/follower provisions can be incorporated in several forms. Successful assistance and establishment of a second source may be one of the factors to be considered in determining which of the competitive development programs will continue into production. Alternatively, the planning for leader/follower can be a basis for selection, with the advantage of minimizing cost investment but the disadvantage of postponing the accomplishment.

In the selection of the follower, the procuring agency may designate a specific contractor either through direction to the leader to subcontract with him or through establishing a prime contract relation; this type of relationship would usually arise where there is some substantial prior investment to protect, such as an already partially-developed capability, specialized facilities or tooling in place (either contractor or government owned), or the like. In other cases, the procuring agency may compete the selection of the follower, either directly or through the leader.

Special circumstances may require the government to enter into or otherwise specify relationships with suppliers or subcontractors other than the leader and follower. If the interest is in assuring price competition or assuring supply, it may be necessary to require that the leader and follower use separate suppliers, at least for key components. Conversely, where commonality or standardization is of critical interest, the procuring agency may specify a single supplier. Where long lead time requirements on some critical component or material require initiation before the leader (and/or follower) are chosen, the procuring agency may contract directly with the supplier, with provisions for the leader (and/or follower) to take over the contract.

If the intent is to maintain competition through two or more production buys, provisions may be necessary to account for the fact that both contractors are, essentially, in a sole source position. Use may be made of various cost containment techniques, varying the division of award based upon comparative prices, and fixed awards to the low bidder and negotiation with the high bidder. The relationship is considerably less difficult where it is possible to compete the balance of production on a single, winner-take-all buyout.

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7. TIME AND/OR TIMING

Time as a factor may affect the use of leader/follower in several ways, and interacts strongly with other factors, particularly: the characteristics of the item procured, characteristics of potential contractors, and the objectives to be obtained. From a time point of view it appears that there are several potentially critical periods, as follows: 1) the period during which requirements and production planning (including initiating the procurement(s)) is carried out; 2) the period from the beginning of engineering for production to initial production; and 3) the period from initial production until the end of production. In some if not all cases, the "time available" for these periods is dictated by program requirements, although it appears that these "requirements" are subject to change (voluntary or involuntary) and, in some cases at least, are also subject to considerable uncertainty in the early stages of program planning. Leader/follower, to varying degrees, introduces a separate time requirement - "time needed" - and the comparison of "time available" to "time needed" provides the basis for assessing the effect of this factor.

Some users of leader/follower report that time is not a factor of importance in requirements and procurement planning. Several individuals in both government and industry pointed out that the basic process has been used in one form or another for a long time, that setting up second sources: is a common practice, is essentially subcontracting out, and requires little or no more time in procurement planning. This is apparently not always true, however. In some cases, the requirements are controlled by different program offices which have little interest in aggregating their "buys", particularly where delivery schedules or initial costs may be affected. If aggregation is required to obtain some minimum quantity level (and to assure commonality to provide logistics advantages), some time may be required to "sell" the several program offices. Similarly, the several different types of leader/follower arrangements may require allowance of time for industry response, e.g., forming of teams or soliciting subcontractors.

The period to initial production is essentially determined with the selection of the initial producer, whether sole source or leader. Initial quantities are available from him alone whether or not there is a follower. If the initial producer does not (or is not expected to) have sufficient capacity to meet the initial production schedules, this provides, in itself, a major reason for a leader/follower relation, e.g., ship production. In most cases, however, it appears that the follower is not depended upon to meet initial production requirements. An exception to this

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may appear where the leader and the follower work together during development so that each is ready to begin production in parallel (e.g., the ASPJ program).

From a time point of view, the length of the period from initial production until the end of production appears to have a significant effect upon the use of leader/follower, particularly if the objective is cost reduction or assurance of supply. In order to achieve significant cost savings, it is necessary to have sufficient time to get the second source fully qualified, including sufficient production experience to be able to develop a cost base. There then must be enough time (and sufficient quantity remaining) to compete and achieve cost savings in excess of the cost of developing the second source. Similarly, if the objective is assurance of supply, an extended production run increases the exposure which leader/follower would serve to protect against. It is not clear, in the non-governmental area, whether assurance of supply, as a reason for second sourcing, is tied solely to long production runs or whether it is also related to initial production requirements.

Time (or timing) as a factor appears, also, in two other forms. First is the question of when to introduce leader/follower; second, how long to sustain the relationship. Where commonality for logistics reasons and/or assurance of supply are objectives, leader/follower may be introduced very early in or at the beginning of the program cycle and maintained throughout production. Where cost savings through competing on large quantities over a long production run is the objective, leader/follower may be introduced at or after the initial production when the production design is more likely to be stabilized.

Where there are significantly long periods of time from initial production until the end of production, the use of leader/follower may be affected in either of two different ways. First, when an item is in production for a significant period, it is likely that the know-how to produce the item will either diffuse to other sources or the state-of-the-art of production will develop in parallel or otherwise catch up; this is, essentially, the situation in much competitive reprourement. The second case arises where a single source has been in production for an extended period, perhaps because small quantities have made second sourcing unattractive to either the procuring agency or industry, and an emergency need for very large increases arises; to achieve a smooth and quick gearing up of a second source may require use of leader/follower.

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8. RULES AND REGULATIONS

The area of rules and regulations may be considered to include all of the imposed conditions (both limiting and facilitating) which are derived from the law. In general, this includes broad, generally applicable conditions as well as specific conditions, i.e., the ASPR (DAR) and derivative rules and regulations. Many, if not all, of the effects, both facilitating and limiting, of rules and regulations on leader/follower are similar to those experienced in comparable procurement situations, and, particularly, in second sourcing. It appears that there may be, in specific instances, some more significant effects because of specific provisions (or lack of provisions).

It appears that the purpose and effect of the salient ASPR (DAR) provision (4-701, 2, 3) is to provide a nominal description and some degree of "legitimization" for the process; otherwise, it apparently neither facilitates nor limits the use of leader/follower or alternate approaches in any of the three areas covered by the provision.

Some regulations appear to be more significant because of the nature of leader/follower contracting; for example, provisions limiting or defining prime contractor-subcontractor rights, provisions regulating the rights of the government in "looking-through" the prime to the subcontractor, provisions on testing and acceptance, and the like. Generally, which regulations are of special interest varies according to the specific circumstances of the particular program and the stage of the process. If the concern is with incentives or other means of assuring an effective transfer of production technology, a wide variety of sources may be relevant, such as incentive contract provisions, provisions on progress payments, provisions on acceptance, provisions on novation, and the like.

One area where present rules and regulations may present a potential problem is with respect to justifying parallel prime awards where the basis cannot be or is not justified by the exception for a national emergency and mobilization base, i.e., some other of the several objectives is applicable. More generally, broad policies against sole source (and negotiated procurement, and multiyear buys) on the one hand and requiring award to the lowest qualified bidder on the other may be (or appear to be) inconsistent with the requirements of one or more of the individual steps which must be planned and carried out in accomplishing a leader/follower program. Without here suggesting a broader reexamination of the assumptions and effects of these, or other broad policy injunctions, it appears that some of the (legitimate) objectives for which leader/follower may be a useful process are not reflected in current provisions.

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In addition to regulations, various derivative and/or complementary administrative requirements may affect leader/follower, such as: advanced procurement planning and related reviews; funding and approval requirements for specific procurement actions; and various reviews of technical progress, particularly those associated with approval for production and for acceptance.

Leader/follower may be significantly affected by or affect other rules and regulations, such as proprietary rights, antitrust, and socio-economic policies, as a last broad category here.

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9. PROCESS AND METHODS

Within the limits imposed by rules and regulations, and reflecting the nature of the program, the objectives to be achieved, and other characteristics or factors, the specific process used, and the choice made among alternative methods, is an important characteristic to be considered.

There are at least three major decision areas to be considered: 1) whether or not to use leader/follower; 2) when to initiate the process; and 3) what methods to use and how to use them.

From a program chronology point of view, consideration of whether to use leader/follower may appear from the earliest planning stages to well into the production cycle. Early consideration facilitates planning (by both the government and industry) but may be inhibited by the higher degree of uncertainty concerning program characteristics, e.g., quantities and schedules. Late consideration has the advantage of high certainty concerning most characteristics but may be too late to introduce leader/follower and obtain the desired objective. Much of the information summarized in this report relates to this decision, and one of the purposes of this study is to contribute to this question.

The question of when to initiate the process parallels somewhat the previous question. It appears that certain objectives (and program characteristics) may strongly suggest that leader/follower should be introduced at some particular point in the process; were it possible to maintain a degree of flexibility in commitment to use (i.e., early steps taken which are not irreversible and no pressure to continue as a "test case"), it would appear that early introduction (in those programs where it appears to be applicable) would allow planning and periodic review as characteristics of the program become more certain.

It appears that current experience with leader/follower has not only identified specific methods which are particularly useful but also makes clear the importance of experience and competence across the broad array of procurement methods available and the essentially unique nature of each use of leader/follower. This apparent dichotomy is similar to that which occurs in, at least, any important and complex acquisition program: analysis drawing upon similarities with prior experience; synthesis to develop that combination which meets the specific characteristics of the new program.

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APPENDIX C

ASPECTS OF LEADER/FOLLOWER FROM THE COMMERCIAL SECTOR

Note: This appendix includes the following:

1. Introduction C-1
2. Problems C-3
 - A. Training C-3
 - B. Motivational Factors C-5
 - C. Organizational and Jurisdictional Barriers C-7
 - D. Start Up and Learning Curves C-9
3. Selected References on Technology Transfer and Other Subjects Related to Leader/Follower in the Commercial Sector..... C-11

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1. INTRODUCTION

There is much concern in the commercial sector with the effectiveness of L/F-type situations in producing high technology products and processes in a timely, cost-effective manner, without damage to either the leader, the follower, or interested third parties--e.g., the purchaser or user of the resulting product or process. Although the term is rarely used, there are many instances of technology, information and skill transfer in the commercial sector which resemble those in the military L/F situation. Some of them are:

- Common licensing arrangements in which the licensor agrees to help the licensee to implement an item of technology (process, product, material, method of manufacture) and adapt it to the licensee's particular circumstances.
- Unusual licensing arrangements in which the licensor goes much beyond the role of technical assistance and assumes major responsibility for assuring that the item of technology works in the licensee's organization, short of complete turnkey operations where there may be less of a technology and more of a financial transaction.
- Straightforward training situations, whether or not a license or turnkey arrangement is involved.
- Joint technology/production ventures where the partners bring complementary experience and skills to the arrangement.
- Start-up of new processes, plants, or whole technologies for which there is no direct parallel in the experience of the operator or owner.
- Technology utilization types of transfers from government laboratories (e.g., NASA, DOE, NIH) or their contractors to the commercial sector, where major adaptations of the original technology must be made.
- Transfers of technology and new or improved products/materials/processes from Research Institutes (RIs) in developing countries (LDCs) to the private or public sector.
- Attempts at transition of new or improved products/processes/materials from corporate research laboratories to the engineering or development groups in operating or product divisions.
- Transfers directly from corporate R&D (often where there is no real R&D at the divisional level) to division manufacturing plants.
- Classical arms-length subcontracting for technology items that may fit into a larger package and thus involve coordination and integration of efforts of a number of organizations.

There are many sources of variation in the above modes and instances of transfer, including: the combinations of partners in terms of general technological sophistication or experience with the particular technology being transferred

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or similar technologies; the locus of power in the transfer relationship--i.e., does the technology source or the technology receiver dominate the relationship and call the shots in areas of disagreement; the urgency of the transfer case; the role of third parties--e.g., is it a forced transfer made necessary by a contractual relationship that the source, the receiver, or both are unhappy about; what is at stake in the transfer--is it merely an incremental piece of technology that is a matter of low importance to either or both parties or is it a matter of vital interest to one or both. Some of these issues will influence how much planning and resources the parties to the transfer will put into it and, hence, influence the effectiveness of the transfer.

In the remainder of this section we will discuss a number of the problems that commonly arise in connection with these kinds of commercial technology transfers. Such a cataloging of problem areas may be of value in alerting participants in leader/follower and other second-sourcing or multiple-supplier arrangements to areas that need careful planning and attention both before and during the actual transfer of information/technology/skills.

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2. PROBLEMSA. Training

Although it appears to be a truism that "adequate" training is necessary when any new technology is being introduced or transferred between people and organizations, the actual planning and execution of adequate training often falls between the chairs in many transfers. The assumption is often made that the receiving party will take care of any training that has to be done and that the source is not responsible for it unless it is explicitly called for in a contractual arrangement. This situation may be aggravated by the unwillingness of receiver-organization management or other individuals in the receiver organization to admit that they are unfamiliar with the new technology or have doubts about their capacity to handle it. Such gaps in understanding or pride-driven cover-ups can cause not only extraordinary delays in the transfer, but also significant mistakes in translating designs or laboratory prototypes into production prototypes and manufactured items.

In many commercial transactions, of course, the source is reluctant to provide more than the minimal contractually-required training to receiver personnel for reasons of proprietary interest, fear of disclosure to third parties, extra costs, time limitations of their own personnel, and other reasons. In one case we investigated, a commercial company gave up attempting to license some of its R&D results --new products and processes--because their initial explorations convinced them that licensees would demand a significant amount of time of the licensor's key personnel in adapting the technology and seeing the receiver personnel through start-up. Sophisticated purchasers of technology generally insist on explicit training agreements and make sure that the training is delivered as promised. Less sophisticated purchasers or receivers who have weak bargaining power may not be able to obtain adequate explicit training agreements and are even less able to enforce those that are in the transfer or purchase agreement. The latter situation is particularly true of the highly unbalanced power position of many developing countries (LDCs) in dealing with large foreign multi-national sources of technology. Although most such agreements do contain provisions related to training (St. Rossy, Rubenstein, and Chakrabarti, 1976), enforcing them in terms of timing and quality of the trainers and the actual training may be another matter.

From the viewpoint of the source, of course, some modes of training may not be viewed as advantageous to them when agreements permit access to the source's

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facilities and personnel other than the formal trainers. During the foundry technology phase of the giant Kama River project, many comments were made about the extraordinary number of Russians who visited U.S. plants in connection with the project, presumably for orientation and know-how visits beyond the apparent need for training covered in the agreement.

One of the most common slogans in the international technology transfer process is that "technology is transferred by people, not paper". This implies that training is a key aspect of any transfer and that it should be a major focus in any technology transfer arrangement. This is not always the case and its neglect often leads to less-than-effective transfer. The content of transfer goes much beyond the mere communication of technical details and techniques for producing an item. It also includes organizational and cultural aspects, such as proper care for equipment, maintenance, intuitive techniques involving short cuts and getting around seemingly insurmountable problems, etc. In our work on the introduction of numerically-controlled machine tools, for example, we found that such non-obvious skill transfer is an important component of the training function involved in technology transfer (Ettlie and Rubenstein, 1978).

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B. Motivational Factors

Typically, technology transfer agreements, including those within the same organization, occur between groups with different specialties (almost by definition), styles of operation, and motivations. Research and Development (R&D) people have criteria for what is "good work" and, "fun to do" and "needed by the client/receiver". Engineering groups and certainly manufacturing groups typically have quite different criteria. The differences may apply to time perspectives, adequacy of the item in terms of specifications or performance, cost, elegance, and other factors. In our work on the interface between R&D and manufacturing (Fischer, 1978, Ginn, 1978, Fischer, Ginn, Knapp and Sen, 1979) we have found many differences between presumably cooperating groups within the same company that lead to delays, higher costs than expected or necessary, mistakes, and conflict.

Many of these difficulties in an intrinsically difficult process--bringing to fruition someone else's ideas that may not be completely and clearly articulated--are not caused by conscious attempts at delaying the transfer or making it less than effective. However, many specific incidents are, indeed, caused or aggravated by factors such as lack of respect for other groups, inflexible pride of authorship, and other manifestations of the "not-invented-here" syndrome. The common and increasing difficulty encountered by many corporate R&D laboratories in successfully transferring their ideas (in some cases even production prototypes) to operating divisions is rooted in this situation. Complete redesign, no matter how good the original was, is not uncommon when a new item (product or process) comes from corporate R&D to divisional R&D. The more sophisticated the divisional R&D people are, the more likely this is to happen, up to a point where they are on the same technical level as the corporate R&D people in terms of scientific and technical competence. Then it can go either way--the divisional people feel they do not need any inputs from corporate, or the transfer can go much more smoothly as the result of exchanges between technical equals. What sometimes happens in the latter cases, however, is that the divisional R&D people in turn are themselves victims of the NIH syndrome when they try to transfer technology to their own division's manufacturing or even engineering. This situation is not, of course, an unmitigated disaster, because thousands of technology items are successfully transferred every year between such groups. The costs in time, money, and conflict, however, are sometimes prohibitive and many companies have cut back on new product development in favor of incremental improvements that do not encounter these problems.

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There is no neat solution to motivational problems when they exist in a transfer situation. Close attention to the possibilities and systematic efforts to reduce their effects can help tremendously, however (Kohler, Douds, Rubenstein, 1973), and improve the transfer process. Simple acts such as involving operating level personnel in preliminary planning discussions of the transfer--its timing, its feasibility, problems that might be encountered--can go a long way toward easing the kinds of problems discussed above. Part of the difficulty is that most technology transfer agreements, especially between organizations but also within organizations, are agreed to and negotiated between higher echelon personnel without much, if any, participation by the people who must make it work. These latter include many kinds of engineers--product, process, tooling, facilities, materials-handling, and several kinds of manufacturing personnel--quality control, inventory, line foremen, construction and installation people, purchasing, inspection, etc. These people can make or break transfer and often do. More involvement by them in the early stages of the transfer can help to alleviate a great deal of the distress that they are involved in later on when schedules, costs, and performance begin to deviate radically from plans and requirements.

Although the Federal government has had longstanding commitments to transfer of technology from Federal labs, agencies and contractors to the civilian sector, few of the agency programs are working very well. Certainly some of the cause is due to intrinsic inapplicability of the technology itself. However, many cases of failure are due to the lack of motivation on the part of source personnel--e.g., agency laboratory researchers--to help in the transfer beyond supplying the classical "tech briefs" or other written descriptions of their technology items or ideas. In turn, this lack of motivation can be traced to lack of enthusiasm and support for this activity from their immediate supervisors and their laboratory management, despite agency announced policy to the contrary (Chakrabarti and Rubenstein, 1976). Legally and contractually correct "full disclosure" between a source and receiver of technology will not necessarily be effective if the motivation for "more than full disclosure" to the point of active and enthusiastic assistance is missing.

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C. Organizational and Jurisdictional Barriers

Transferring technology across international boundaries, between different kinds of organizations (e.g., research institutes and industrial firms), and even within the same organization--large or small--can encounter many barriers beyond the individual motivational factors mentioned in "B", above. Organizations have different styles of operation, traditions, objectives, evaluation criteria, priorities, legalistic frameworks, and other characteristics which can influence the flow of technology. Despite some feelings that natural language is a major barrier in between-country flows (Kohler, Rubenstein, Douds, 1973) and that specialized technical languages present difficulties even within the same natural language environment, there are many other factors which can interfere with smooth and effective transfers.

Lack of trust between parties to the transfer can be attributed to motivations, as suggested above, but may be more deeply rooted in the legalistic structure and objectives of the involved parties. Our work with a number of agencies that combine R&D with regulation (e.g., in the environmental, standards, transportation, safety, and energy areas) reveal a number of pervasive factors that impede technology and information transfer along the spectrum from laboratory to application. One major factor is the sharp difference in mission and constituency associated with different parties involved in developing and applying a new piece of technology. Some are more responsive to political and economic pressures, while others respond primarily to technical and professional criteria.

Another factor which is closely related to motivation regards territorial attitudes and behaviors--"defending the turf" of a particular group, organization or specialty. Where there is a clear overlap and a possibility of significant disputes exist, several classical mechanisms are available for mitigating or resolving difficulties, if the parties are of good will and able to negotiate or accept arbitration. Where gaps in formal responsibility occur, as appears to be the case in some instances of reactor and product safety, it may be difficult to get any party to accept the responsibility. We are currently involved in a study of process technology transfer between several divisions of a chemical company, and find that the responsibility for the pilot plant is in a no-man's land between functional groups, with significant penalties in cost, time, and performance of new processes.

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No matter how tightly a licensing or transfer agreement is written, all contingencies related to such matters cannot be foreseen and accounted for. Indeed, it would probably paralyze the transfer process if an attempt were made to provide for many of these informal contingencies and eventualities. Within the legal framework of the transfer agreement, however, cards should be placed on the table during the negotiations and early stages of transfer that will disclose significant areas of gap or overlap; and provisions should be made, in a non-panic mode, to anticipate and reduce their negative effects.

Among the organizational techniques used in dealing with R&D/Innovation projects that cut across jurisdictional, functional, organizational, and territorial lines is "team building" in a "matrix" mode. This is a concept and set of techniques which has been widely used in the military and aerospace fields and less widely used in commercial R&D. Many companies are exploring or adopting "matrix management" as an overall approach to resolving inter-functional issues and many commercial R&D organizations are also trying it. For some types of technologies and disciplines it works very well or has to work because it is the only feasible mode of operation that provides for disparate functions, skills, and organizational units to cooperate closely. For other situations it has ranged from not very effective to disastrous. Issues of loyalty, priorities, location, career paths, and many others, including the major ones mentioned above, interfere with its smooth operation.

Substitutes for team or matrix approaches in transfer situations range from minimal interfacing between the parties via "liaison" people to developing completely separate project groups to "get the transfer job done", including all the necessary supporting services and in many cases costly duplication of equipment, people, and facilities. In observing a wide range of transfer situations, such as those listed in the introduction to this section (licensing, joint ventures, etc.), we are struck by the lack of attention to these organizational barriers which can often make the difference between success and failure or less-than-successful culmination of the transfer. More planning and monitoring of these aspects is necessary in most transfer relations, especially where the power to take corrective action is diffused among legally or organizationally independent units, as in the typical leader/follower case.

D. Start-Up and Learning Curves

Although a crucial aspect of any technology transfer, the subjects of learning curves and start-up management have received little attention from researchers on the R&D/Innovation or acquisition/procurement processes. Among the reasons for this are the lack of glamour in the subject relative to innovation itself, difficulty of access to field sites for in-depth study, and the lack of experience with and motivation toward such subjects on the part of most academic researchers. Despite this low level of research interest in the subject, there is a small literature on learning curves that goes back several decades and one on plant start-up (more common for process production than serial production).

Aside from lack of academic research interest in this subject, there is great management interest, primarily when things go wrong in technology transfer--unacceptable costs, delays, and open warfare. However, most of the action taken is reactive in many situations instead of part of the planning process. When schedules are set and a decision program is established for tooling, hiring, training, construction, equipment acquisition, purchasing, marketing, and the many other activities that accompany application or marketing of a new technology item, many managers overlook the need for careful planning and monitoring of the learning curve. "Unexpected delays" are often due to quite predictable difficulties with: specifications--incomplete or uninterpretable; break-in periods for new and unfamiliar equipment, tooling, and materials; and many other aspects of start-up. The small literature referred to above and sampled in the references for this section provides some guidelines for more systematic attention to the "normal" problems of start-up which, to the uninitiated, always seem unusual.

One set of factors in start-up costs, delays, and malfunctions is the inertia of organizations and people in adapting to new technical requirements--e.g., making transistors instead of tubes or using composite materials instead of single-component (metal or plastic) materials. Resistance to change needs to be anticipated and planned for in technology transfer and should be an explicit part of the agreement. Lead times in obtaining tools and dies, assured materials and component supplies, trained or trainable people, and new production equipment are all recurrent problems in start-up and "getting up the learning curve quickly" to get costs down and quality up. They can be planned for to a much greater extent than is done in many R&D/Innovation projects. Part of the problem is that few R&D teams include experienced

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and credible production people who handle many of the supporting engineering and manufacturing functions that make routine production essentially routine (of course emergencies can occur, and do, in routine manufacturing). Therefore, engineers and scientists who are pre-occupied with the front end of the R&D/Innovation process are depended on to anticipate problems and suggest solutions that are outside their experience and capabilities.

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C. SELECTED REFERENCES ON TECHNOLOGY TRANSFER AND OTHER SUBJECTS RELATED TO LEADER/FOLLOWER IN THE COMMERCIAL SECTOR

The items in this section were selected from our own research papers on technology transfer and other subjects related to leader/follower in the commercial sector. They illustrate some of the issues discussed above. This is not intended as a comprehensive or definitive bibliography on the subject, but a sampling of the material from academic research programs. The bibliographies of some of the referenced articles can provide leads to further material on various sub-topics.

Chakrabarti, Alok K., and A. H. Rubenstein. "Interorganizational Transfer of Technology: A Study of Adoption of NASA Innovations," IEEE Transactions on Engineering Management, Vol. EM-23, No. 1, February 1976, pp. 20-34.

Ettlie, John E., and A. H. Rubenstein. "Social Learning Theory and the Implementation of Product Innovation." Department of Management, College of Commerce, DePaul University, Chicago, and Program of Research on the Management of Research and Development, Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston. Revised September 1979.

Fischer, Bruce. "Success in Passing (an R&D Project From Development at a Centralized Lab Into Production at a Division)." Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston. November 1978.

Fischer, Bruce, Martin Ginn, Connie Knapp, and Falguni Sen. "The Problem of Interface Between R&D and Production in a Large Chemical Manufacturing Company." Department of Industrial Engineering and Management Science, Northwestern University, Evanston. June 1979.

Ginn, Martin. "R&D Interface with Production." Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston. January 1978.

Köhler, B. M., A. H. Rubenstein, and C. F. Douds. "A Behavioral Study of International Technology Transfer Between the United States and West Germany," Research Policy 2 (1973), pp. 160-184.

Rubenstein, A. H., William E. Souder, and Eliezer Geisler. "An Organizational Design Approach to Project Management in a Government Research and Development Organization," prepared for presentation at the 1979 IEEE Engineering Management Conference, November 5-7, 1979, Arlington, Virginia.

Saint-Rossy, Dan T., Alok K. Chakrabarti, and A. H. Rubenstein. "International Transfer of Technology, An Evaluation of the Education and Training Component," POMRAD, Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, and the United Nations Education, Scientific and Cultural Organization. May 1976.

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APPENDIX D

PROTOCOLS

Note: This appendix includes all of the protocols which were formalized. Drafts and partial drafts of additional protocols for each of the identified major "factors" were not formalized when it became apparent that they would be of limited use for purposes of the immediate study.

The protocols include the following:

- I. (Cover letter) D-1
- II. Background Information on Source D-2
- III. Background Information on
Specific Program D-3
- IV. Description of Specific L/F
Type Program D-5
- A. Specific Government Objectives D-9

D-1
INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)
2348 RIDGE AVENUE
EVANSTON, ILLINOIS 60201 U.S.A.

TELEPHONES: (312) 492-3680, 869-1866
TELEGRAPHIC ADDRESS: IASTA, INC.

The Air Force Business Research Management Center (AFBRMC), WPAFB, OH, has contracted with us to conduct a modest study of past experience with and present practice of "leader company procurement" as a basis for recommendations concerning when and how to use the method. "Leader company procurement" is defined in ASPR 4-701 as follows:

Leader company procurement is an extraordinary procurement technique under which the developer or sole producer of an item or system (the leader company) furnishes manufacturing assistance and know-how or otherwise enables a follower company to become a source of supply for the item or system.

We hope to identify the literature (both formal and informal), government programs and program offices, and companies which are directly involved with leader company procurement. We expect to look not only at specific programs identified as "leader company procurement" but also programs which use similar methods to develop second sources under similar conditions. From individuals identified in this process, we hope to obtain information and opinions which will make it possible to provide realistic and effective recommendations. We are not constrained by any preconceived notions or positions on efficacy.

We hope to provide a reasonably complete and responsible study which can serve as a baseline or reference point.

Albert H. Rubenstein (312) 492-3680
Charles W. N. Thompson (312) 492-3383

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II. BACKGROUND INFORMATION ON SOURCE

This information is important to us for two reasons: first, so we can contact you to clarify any details we missed; second, so that we can better interpret the information you are providing. You will not be directly identified with any of your specific answers. We would, however, like to identify you as part of an overall listing of sources, if agreeable: yes ☐ no ☐

Name _____
Present address _____
and _____
telephone number _____

If you are now or were associated with a specific L/F type of procurement, please provide the following information:

Name of program (including specific part, if appropriate) _____

Period of your association _____ to _____

Your function, title, or assignment _____

Relevant prior education or experience (technical, administrative, contractual, operational, etc.):

Comments (use back of sheet, if necessary)

III. BACKGROUND INFORMATION ON SPECIFIC PROGRAM

This form is applicable to specific L/F programs or similar programs where there is an "extraordinary" planned effort to develop or establish a second source for initial (or early) production. If there are significant differences in the item to be processed and/or differences in the "leader" or "follower" company, each should be treated as a separate program for purposes of this form.

Name of program _____

(If the L/F applies to a specific
sub-part, identify that also) _____

Procuring organization _____

"Leader" company (if identified) _____

"Follower" (second source) company (if identified) _____

Time frame

Date (or expected date) of
development and/or preproduction-
procurement contract _____

Date (or expected date) of
second source procurement _____

Date (or expected date) of
completion of second source procurement _____

If program is explicitly identified with ASPE 4-701, please check here ☐

If not, please briefly describe the procurement method.

Please do not use this space

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Specific Program (p. 2)

It would be helpful if you could provide any of the following information:

Names (addresses and telephone numbers, if available) of knowledgeable individuals (on this program) in the procuring organization or the contractors

Reference to documents (procedures, guidelines, checklists, policy statements, RFP or contract terms, or other relevant references):

☐ If you have any other information, please provide it below.

IV. DESCRIPTION OF SPECIFIC L/Y TYPE PROGRAM

This form is applicable to specific L/Y programs or similar programs where there is an "extraordinary" planned effort to develop or establish a second source for initial (or early) production. If there are significant differences in the item to be processed and/or differences in the "leader" or "follower" company, each should be treated as a separate program for purposes of this form.

1. Name of program
(If the L/Y applies to a specific sub-part, identify that also)
-
-

NOTE: If you did not fill out the accompanying background information on specific program (form III), please check it for accuracy, and make any corrections or additions.

2. Initiation:
(When, and from whom, did the original idea for L/Y (or related second sourcing method) originate?)

3. Objectives:
(What objectives were to be accomplished, how were they identified? Were they considered realistic? Were they changed later (deleted, added to)? Were there differences between the procuring organization and higher echelons?)

Please do not use this space

Description (p. 2)

4. Factors facilitating or limiting use:

(What factors were considered in making the decision to use L/F (or similar second sourcing) method?)

A. Objectives:

(Required effort to second source? Higher echelons directed it?)

B. Availability of alternative methods:

(Was only one considered? Other methods not appropriate?)

C. Characteristics of procurement:

(Large quantity? Large number? Program has high visibility?)

D. Reproductment data base:

(Inadequate for second sourcing? Problems with proprietary items?)

E. Characteristics of (potential) contractors:

(L has capability to provide services to F? Interested second sources?)

Description (p. 3)

F. Characteristics of procuring agency:

(Administrative resources--knowledge of L/F? Technical resources? Policy position?)

G. Relation between government and contractors:

(Negotiating position? Appropriate available contracting arrangements--4-703?)

H. Time and/or timing:

(Sufficient administrative lead time? Production delivery schedule compatible?)

I. Rules and regulations:

(Procedures available? Reviews acceptable?)

J. Expected effects or results:

(Feasible? Effects on cost, time, performance? Operations? Services? Logistics?).

Description (p. 4)

3. Requirements planning (and/or prior history):
(Anything special or different?)

5. Procurement planning:
(What special steps?)

7. Solicitation and award:
(Identifying bidders? RFP? Evaluation? Negotiation?)

8. Contract administration:
(Special techniques or monitors? Problems?)

9. Post contract (or subsequent contracts):

A. SPECIFIC GOVERNMENT OBJECTIVES

This is a listing of objectives which have been suggested by a number of sources as applicable to the use of L/T (and similar second sourcing) procurement methods. You are encouraged to add to or modify items on the list.

If your answers are with respect to a specific L/T (or similar) program, please fill in the program name here: _____

If your answers are based on experience in general and/or study of L/T (and similar) procurement methods, please check here: ☐

	VERY IMPORTANT	MODERATELY	SOME	NO EFFECT	NEGATIVE EFFECT	DON'T KNOW
GENERAL:						
Shortening the time for delivery	/	/	/	/	/	<input type="checkbox"/>
Establishing additional sources of supply for reasons such as geographical dispersion or broadening the production base	/	/	/	/	/	<input type="checkbox"/>
Making maximum use of scarce tooling or special equipment	/	/	/	/	/	<input type="checkbox"/>
Achieving economy in production	/	/	/	/	/	<input type="checkbox"/>
Assuring uniformity and reliability in equipment performance	/	/	/	/	/	<input type="checkbox"/>
Eliminating problems in use of proprietary data	/	/	/	/	/	<input type="checkbox"/>
Effecting transition from development to production	/	/	/	/	/	<input type="checkbox"/>
SPECIFIC:						
Obtain price competition on first production procurement	/	/	/	/	/	<input type="checkbox"/>
Obtain price competition on future production procurement(s)	/	/	/	/	/	<input type="checkbox"/>
Obtain technical competition	/	/	/	/	/	<input type="checkbox"/>
Establish basis for future competitive rather than sole source procurement for policy reasons	/	/	/	/	/	<input type="checkbox"/>

Please do not use this space

Specific Objectives (p. 2)

	VERY IMPORTANT	MODERATELY IMPORTANT	SOME	NO EFFECT	NEGATIVE EFFECT	DON'T KNOW
Establish production capability to meet mobilization requirements	/	/	/	/	/	<input type="checkbox"/>
Supplement inadequate production capacity in first source	/	/	/	/	/	<input type="checkbox"/>
Establish second source with more economic production capability	/	/	/	/	/	<input type="checkbox"/>
Reduce front end costs (and costs of "reverse engineering") for second source	/	/	/	/	/	<input type="checkbox"/>
Avoid "buy ins" and subsequent change orders, defaults, delays, or bailouts	/	/	/	/	/	<input type="checkbox"/>
Reduce government administrative costs--contracting, technical surveillance, proofing technical data, etc.	/	/	/	/	/	<input type="checkbox"/>
Assure uniformity and reliability in performance	/	/	/	/	/	<input type="checkbox"/>
Assure compatibility or standardization of components	/	/	/	/	/	<input type="checkbox"/>
Assure interchangeability of parts	/	/	/	/	/	<input type="checkbox"/>
Minimize operating costs (training, use, etc.)	/	/	/	/	/	<input type="checkbox"/>
Minimize service cost (logistics, support, maintenance, supply, etc.)	/	/	/	/	/	<input type="checkbox"/>
Avoid cyclic production (boom and bust) in first source	/	/	/	/	/	<input type="checkbox"/>
Provide broader technical and production knowledge in product area for future procurements	/	/	/	/	/	<input type="checkbox"/>

APPENDIX E

SELECTED REFERENCES

Note: This appendix consists of revisions and additions to a preliminary listing which appeared as an Appendix to the First Technical Report. While the preliminary screening was based upon use of a variety of search techniques, the final decision to include was, in all cases, based upon review of the actual document. For each entry an annotation is provided, using abstracts prepared by the author where appropriate.

For convenience in reference, the listings are categorized as follows:

1. Direct references to leader/follower (or leader company procurement) and references to similar or closely related procurement methods. E-
2. References to factors interacting with or potentially affecting the use of leader/follower methods. E-
3. Historically significant references and tutorial or background references useful in establishing context. . . E-

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1. Direct References

Anonymous (Publication Staff).

Contract Policy: DOD Reports Only Eight Categories of Procurement Caused Downward Trend in Contract Competition (Article).

Federal Contracts Report, No. 807, November 19, 1979, pp. A-25 to A-28.

News story and/or commentary drawing from several current sources, including testimony of Dale W. Church, Deputy Under Secretary of Defense (Acquisition Policy) in front of the House Budget Task Force on Government Efficiency. Among remedial actions was listed specific reference to the "leader/follower" concept (p. A-26).

Carter, Gregory A. (The RAND Corporation).

Directed Licensing: An Evaluation of a Proposed Technique for Reducing the Procurement Cost of Aircraft (Report).

Report No. R-1604-PR, December 1974, 131 pp. The RAND Corporation, Santa Monica, CA 90406. AD A 007064.

(This study presents) an evaluation of the feasibility of introducing price competition into military aircraft procurement by the technique of 'directed licensing,' whereby the government obtains from a weapon system developer, at the time of issuance of the development contract, a commitment for rights to production data and an agreement to license whomever the government designates to produce the system during any or all production runs, following initial production by the developer. Case studies of related types of aircraft procurement are presented, showing that competitive bidding has resulted in substantial savings as compared to sole-source procurement. Techniques for moving aircraft production from one manufacturer to another are described to indicate the technical feasibility of the directed licensing concept, and a minimum-risk way in which directed licensing could be tried is outlined. In view of the potential significant cost savings that could result from the introduction of directed licensing, the report urges that the concept be tested in practice. Although this study focuses on aircraft procurement, the results should be equally applicable to procurement of other complex weapon systems (Author's abstract).

Clark, Charles L. (Aeronautical Systems Division, AFSC).

Leader/Follower Program - Aces II Ejection Seat (Article).

Proceedings Seventh Annual Acquisition Research Symposium, Hershey, PA, May 31-June 2, 1978, pp.353-355. Available from Air Force Business Research Management Center, AFBRMC/LGPB, Wright-Patterson AFB, OH 45433.

Describes the use of leader/follower procurement to provide for future competition, emphasizing importance of factors such as planned long production run and high front end costs, effective resolution of proprietary rights issues, preparation of a thorough statement of work for the follower (with quality control remaining with leader), establishing a follower source selection plan, and providing incentives to leader (using contract finance provisions).

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Comptroller General of the United States.

Report to the Congress on Evaluation of Two Proposed Methods for Enhancing Competition in Weapons Systems Procurement (Report).

Report No. B-39995, July 1969, 57 pp. U.S. Army Logistics Management Center, Fort Lee, VA 23801. LD No. 24036.

This report evaluates two methods for improving competition in Defense Department procurement of weapon systems, components, spare parts, and related items. The two methods--parallel undocumented development and directed technology licensing--were designed for use in situations where competition has been absent or elusive. Besides a description of each of these methods, reasons are given why parallel undocumented development is favored. The report explicitly discusses reprourement conditions suitable for "leader company procurement and second sourcing" (pp.36, 45, 52).

Department of Defense.

Leader Company Procurement (Regulation).

Part 7, Special types and methods of procurement, Armed Services Procurement Regulation, 1 July, 1976, sections 4-701 to 4-703.

Regulation defines and describes the objectives (4-701), outlines limitations on use (4-702), and summarizes three alternate contracting procedures (4-703).

Gordon, Harvey J. (Office of the Assistant Secretary of the Air Force).

Defense Equipment: Second Sourcing Production (Article).

Program Manager, Vol. 8, No. 4, July-August 1979, pp. 4-5.

Excellent summary of the second sourcing process. Identifies reasons (or goals) for establishing a second source, outlines the kind of factors which affect selection of method, and describes alternative contracting methodologies, including leader/follower.

Hoppe, Darrell R. (Captain, A-10 System Program Office).

Dual Awards and Competition - You Can Have Both (Article).

Proceedings Seventh Annual Acquisition Research Symposium, Hershey, PA, May 31-June 2, 1978, pp. 344-346. Available from Air Force Business Research Management Center, AFBRMC/LGPB, Wright-Patterson AFB, OH 45433.

Describes methods used to achieve and maintain competition in dual award procurement. Relative to leader/follower, describes reasons for (maintain mobilization base and competitive sources), and notes requirement on original development-production contractor to develop a second source subsequent to first follow on contract for a major subcontract item.

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INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIAT--ETC F/G 15/5
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INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Johnson, Robert E. (The RAND Corporation).

Technology Licensing in Defense Procurement: A Proposal (Unpublished Paper).

November 1968, 12 pp. The RAND Corporation, Santa Monica, CA 20330.
AD 681117.

Briefly reviews the barriers limiting competition in defense procurement, the similarities to and differences from commercial programs, and major techniques used by the government. This is followed by a description of how directed or compulsory licensing can be used to provide competition, with extensive discussion of the various issues, such as royalty payments and safeguards for both parties.

Lamm, David V., (Lieutenant Commander, Naval Air Systems Command Headquarters).

Dual Sourcing in Major Weapons Systems Acquisition (Article).

Proceedings Seventh Annual Acquisition Research Symposium, Hershey, PA, May 31-June 2, 1978, pp. 347-351. Available from Air Force Business Research Management Center, AFBPMC/LGPB, Wright-Patterson AFB, OH 45433.

Describes dual or second sourcing, listing a) reasons, including obtaining competition and mobilization production capacity, b) requirements, including a good technical package, large quantities, available qualified government technical personnel, interested sources, and sufficient lead time, c) benefits, including price reductions, improvements in technical data, insurance against delivery delays, obtaining mobilization base, and maintaining a resource base, d) examples of use, and e) lessons learned. Brief well written overview.

Leak, Barry R. (The George Washington University).

Government Procurement Policy: A Survey of Strategies and Techniques (Report).

Report No. Serial T-354, May 12, 1977, 28 pp. School of Engineering and Applied Science, The George Washington University, Washington, DC.

This paper presents a discussion of United States military procurement policies from 1947 to the present. Alternative contract types are discussed, with emphasis upon the allocation of risk between the contractor and the government. Strategies for the acquisition of major weapon systems are examined, and the impact of these strategies upon competition in the procurement process is considered (Author's abstract). With reference to leader/follower, a brief but excellent discussion places the method in the context of closely related methods (pp. 79-20).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Muller, J. A. (U.S. Army Missile Command, Redstone Arsenal, AL).

Competitive Missile Procurement (Article).

Army Logistician, Vol. 4, No. 6, November/December 1972, pp. 8-11. LD No. 28327.

"Competitive bidding has long been a preferred Army procurement practice, but missiles and other complex weapons systems are often available only from a single source. The author tells how the Army Missile Command has developed competitive sources and multiple bidders for missile production contracts" (Abstract printed with the article). Discusses use of "education order" and "should cost" studies.

Muller, John A.

Competitive Missile Procurement (Article).

The Fifth Annual Department of Defense Procurement Research Symposium, Monterey, CA, November 17-19, 1976. pp. 98 - 112. Availability unknown.

Second sourcing is discussed, with the optimal situation being that competition could be conducted among potential producers who have demonstrated an ability to produce a complex system on schedule and in accordance with specifications. A U.S. Army Missile Command method uses tools available in the procurement workshop to derive benefits which result from having two capable sources compete for the production of the same missile. The "winner-take-all" competition is also described.

Nash, Ralph C., Jr. (The George Washington University).

Parallel Undocumented Development (Article).

Defense Management Journal, Vol. 5, No. 4, Fall 1969, pp. 16-21.

Describes procurement method author proposed to a Senate Judiciary Subcommittee as a procurement strategy for advanced systems which have probable technological or strategic uncertainties. Outlines procurement strategies which have evolved to deal with management, technical and cost problems, presents advantages and disadvantages of parallel development under austere conditions of little paper work, including trade off of increased development costs against production savings through better cost definition, potential decrease in development time, and increased technical insurance. Compares with contract definition, total package procurement (which is proposed to be the logical next step), and multiple incentive contracts.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Office of Federal Procurement Policy.

Leader Company Contracting (Draft Regulation).

Part 17, Special Contracting Methods, Federal Acquisition Regulation (Draft), 1979, sections 17.401 to 17.403.

Draft regulation defines, outlines limitations, and summarizes alternate contracting procedures in substantially same form and content as current ASPR 4-701 through 4-703. Note further there is no comparable FPR provision.

Sherman, Stanley N. (The George Washington University).

Federal Procurement Principles: Text and Readings (Book).

Washington, DC: The George Washington University, 1972, 539 pp.

Brief, concise description and discussion (pp. 15-12 to 15-15) of leader company procurement; includes reference to the World War II relation between Convair and Ford Motor on the B-24 and the Korean Conflict relation between Pratt and Whitney and Ford Motor for aircraft engines. (Note: This appears in Chapter 15, "Specialized Buying Approaches," pp. 15-1 to 15-24, by Stephen F. Cameron.)

Soderquist, Larry L. (Captain, USAF).

Leader/Follower: An Analysis of a Proposed Technique for Increasing Competition in Air Force Weapon System Procurements (Thesis).

Report No. AFIT/GSM/SM/79S-13, September 1979, 114 pp. Air Force Institute of Technology, Wright-Patterson AFB, OH 45433.

Study draws upon a search of the literature and a case study of the Air Force High Technology Ejection Seat (ACES II) to identify fourteen factors "that must be exhibited by a system before an acquisition program can be adapted to the leader/follower procurement technique." Using these factors, a model is developed in four parts, as follows: a decision model to determine adaptability; an economic decision model; an implementation decision model; and a long-term effects model.

Thorpe, John, Jr. (Captain, U.S. Army Logistics Management Center).

A Study of the Leader/Follower Contract Procurement Strategy (Unpublished Paper).

PMDC Class 79-1, November 1978, 13 pp. plus appendices, U.S. Army Logistics Management Center, Ft. Lee, VA 23801.

Reviews leader/follower concept; mentions Air Force use for the "Ground Launched Cruise Missile (communications portion) and the High Technology Ejection Seat System"; presents with a series of charts the evaluation of cost and schedule in the decision process; and discusses implementation. The appendices include excerpts from work statements and contracts.

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2. Interacting Factors

Bemis, John C. (DOD Product Engineering Services Office, DLA, Alexandria, VA 22314).

Baseline Indicators of Production Readiness (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 117-118. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Preliminary study to establish meaningful and measurable indicators of production readiness based on data normally required as part of defense contracts; indicators primarily based on process variables, including, as one of the best, engineering change traffic profiles.

Cheney, William F., IV (Lieutenant Colonel, Aeronautical Systems Division, Air Force Systems Command, USAF).

Strategic Implications of the Experience Curve Effect for Avionics Acquisitions by the Department of Defense (Article).

Proceedings Seventh Annual Acquisition Research Symposium, Hershey, PA, May 31-June 2, 1978, pp. 53-58. Available from Air Force Business Research Management Center, AFBRMC/LGPB, Wright-Patterson AFB, OH 45433.

Summarizes author's doctoral dissertation which examined seven issues using data from 361 procurements representing 20 equipment items and 13 contractors. Conclusions for each issue are presented as well as a series of procurement recommendations, including recognition of the variety of other interacting factors such as differences in the defense business, market position, standardization, and producer risks, providing a rich context relevant to leader/follower.

Cochran, E. B., and A. J. Rowe.

The Sources of Disruption to Project Cost and Delivery Performance (Article)

Proceedings of the Sixth Annual Department of Defense Procurement Symposium, West Point, NY, June 1977, pp. 533-575. Available from U.S. Army Procurement Research Office, U.S. Army Logistics Management Center, Fort Lee, VA 23801.

Detailed description of the research to development to production process, with particular attention to disruption as a consequence of schedule overlaps. Of particular interest is a graphical comparison of various forms of overlap, and a description of the "production start-up" stage, as follows: "It is the period during which the organization translates the plans and specifications into working drawings suitable for use by vendors and shop personnel, develops detailed production methods and tooling, prepares detailed plans for production, establishes its vendor support and issues necessary purchase orders, plans necessary to facility enhancement and organization changes, and then implements its plans for an orderly start of production."

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Commission on Government Procurement.

Report of the Commission on Government Procurement (Report).

Volumes 1, 2, 3, 4, plus index, December 1972. Superintendent of Documents, U. S. Government Printing Office.

Broad review of procurement, with series of recommendations. While a number of sections bear some indirect relation to leader/follower, there is little or no direct discussion. Of potential significance is the description of total systems performance responsibility clauses (TSPR) and associate contractor agreements in Volume 2, pp. 168-169.

Garza, Fred, Jr.

Impact of Competitive Procurement on Configuration Control (Report).

Report No. PMC 77-1, May 1977, 34 pp. Defense Systems Management College, Ft. Belvoir, VA 22060. AD A 042876.

The purpose of the report is to provide insight into the configuration control problems that can occur after a competitive procurement. The report discusses the configuration control problems experienced by the 5"/54 MK 45 Lightweight Gun System Program Office as a result of a competitive procurement. Specifically the problems areas discussed include configuration identification, change control and configuration status accounting. The configuration control procedures formulated and implemented to correct the problems identified are also discussed. (Author's abstract).

Gibson, Robert G. (Lockheed Missiles & Space Company, Inc.).

Concurrency (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 71-72. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Briefly summarizes the historical arguments supporting and opposing concurrency, and suggests that concurrency does not seem to be the reason programs get into trouble, that management of concurrency is demanding and risky, and that advantages, beyond cost savings and early capability, accrue in continuity, smooth transitions, and more directed progress.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Griffiths, Kenneth, and George A. Kanzaki.

The Technical Data Package and Competitive Procurement (Article).

Defense Management Journal, Vol. 8, No. 1, April 1972, pp. 17-21.

Successful competitive procurement of military design equipment depends not only on the "adequacy" of the technical data package (TDP) but also on the effective transmission of the TDP to the competitive marketplace. The improvement of both of these factors is the subject of this article. The article highlights the central role that technical data plays in government/industry contracting, specifically as instruments for communicating clearly the respective obligations of the government and contractors. Reference is made to a technique called PPE (Preproduction Evaluation) which is an arrangement for in-depth scrutiny of TDP's by contractors prior to production (Abstract from DLSIE).

Kluge, Arthur J., and Richard R. Lieberman (Telecote Research, Inc.).

Analysis of Competitive Procurements (Report).

Report TM-93, "For Official Use Only", August 1978, 112 pp., plus appendix. Telecote Research, Inc., Santa Barbara, CA 93111.

Candid, extensive study of five missile programs and a torpedo program with the general conclusion that "the government (and taxpayers) have not benefited appreciably from competition among suppliers." For each program a short system description and contract history is followed by verbal, tabular and graphical presentation of available data and analyses performed. In some cases, it would appear that leader/follower or related methods were employed.

Johnson, Robert E., and James W. McKie (The RAND Corporation).

Competition in the Reprocurement Process (Report).

Memorandum RM-5657-FR, May 1968, 70 pp. The RAND Corporation, Santa Monica, CA 90406. AD 670567.

Focuses on the problem of obtaining competition in the reprocurement of weapon system components, support equipment, and other technical hard goods. Currently, packages of technical data are distributed among firms that were not involved in earlier R&D and production activities; these policies and their impact on competition are noted. Also discussed are interfirm commercial transfers of production technology; governmental transfer techniques are contrasted with those used by the aerospace industry. To improve access to production technology, thus increasing competition, the use of directed licensing and the application of commercial transfer techniques are explored.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Lamb, Amherst R., and Dean D. Hause (Lieutenant Colonel and Major, USAF, respectively).

What Should Reprocurrency Data Cost? (Thesis).

Report No. SLSE 33-76B, August 1974, 104 pp. Air Force Institute of Technology, Wright-Patterson AFB, OH 45433. AD 787196.

The purpose of this thesis is to examine the factors that may increase or decrease the cost that the Government (specifically, the Air Force) pays for reprocurrency data and to determine how much the Air Force should pay for this reprocurrency data. This is the data that enables the Air Force to competitively buy spare parts after a major system becomes operational (Excerpt from authors' abstract).

Lovett, Edward T. and Monte G. Norton (Department of Energy and Department of Army, respectively).

Determining and Forecasting Savings from Competing Previously Sole Source/Noncompeting Contracts (Final Report).

Final Report No. AFRO 709-3, October 1978, 103 pp. Army Procurement Research Center, U. S. Army Logistics Management Center, Ft. Lee, VA 23801. LD 42936C.

The savings achieved by introducing competition into the production of weapons systems can be reasonably estimated. Of the sixteen items analyzed, five showed a loss due to competition. Savings for the sixteen items averaged 10.8 percent. The forecasted savings methodology (FSM), which was developed from the analysis of the sixteen systems, is a useful tool which provides an estimate of the expected savings, or loss, from introducing competition as well as an analysis of the qualitative factors influencing competition (Excerpt from authors' abstract). While descriptions of production histories use the term "educational buy" some of the subject procurements may be leader/follower; note also that part of the data is incorporated from a study by L. J. Kluge and R. R. Lieberman.

Martin, Martin D., et al (Lt. Colonel, AFIT, and ASD).

A Comparative Analysis of the Application of Production Readiness Reviews (Article).

Proceedings of the Sixth Annual Department of Defense Procurement Research Symposium, West Point, NY, June 1977, pp. 591-607. Available from U.S. Army Procurement Research Office, U.S. Army Logistics Management Center, Fort Lee, VA 23801.

Describes the use of production readiness reviews by the Air Force, with reference to DSARC III and AFSCR 84-2. Of particular interest is a tabular presentation and ranking of 25 AFSCR 84-2 questions, representing a consensus among ten AFSC experts.

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McCubbins, Eugene L. (Navy Material Command).

Innovations in Industrial Preparedness (Article).

Proceedings DOD Procurement Symposium: Progress and Research in the Seventies, Wright-Patterson AFB, OH, February 23-24, 1972, pp. 37-45. Available from Air Force Institute of Technology, Wright-Patterson AFB, OH 45433.

Discusses the problems associated with, and the planning required for, a mobilization base, including comment on the inadequacy of ASPR 3-216.2 for this purpose.

McIntosh, Timothy (Directorate of Cost Analysis, Comptroller of the Army).

Critique of MICOM and ECOM Studies on Cost Reduction (Sole Source vs Competitive Procurement) (Unpublished Paper).

February 1976, 4 pp.

Very brief, disciplined analysis of cost studies on the TOW, SHILLELAGH and AN/ARC-54 programs; generally concludes that data and models used do not substantiate claimed cost reductions due to introduction of competition.

Malcher, Arlyn J., et al. (Kent State University).

Modeling the Acquisition Structure and Process (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 41-43. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Proposes a model which enables systematic evaluation of whether important variables and relationships have been identified; presents a partial model in graphic form categorizing and dimensioning background variables, buyer/seller/transaction variables, and outcome variables. In background, or introduction, explicitly notes, among policies and experiments in the last decade, leader/follower procurement, as well as second sourcing and separation of acquisition process into stages with technology licensing and breakouts.

Mitchell, Donald R. (Office of the Secretary of Defense).

Technical Data Management - Progress and Problems (Article).

Defense Management Journal, Vol. 9, No. 2, April 1973, pp. 30-32.

Informative and informal discussion of the process for acquiring technical data to support various purposes, including procurement.

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Neate, John D., and Malcolm A. Burgess (ARINC Research Corporation).

Assessment of Historical Cost Data Regarding the Effects of Competition on DOD/Military Procurement Costs (Unpublished Paper).

Prepared for presentation at the Eleventh Annual DOD Cost-Analysis Symposium, Airlie, VA, November 1976. Publication 6411-1555, 10 pp., plus appendices, ARINC Research Corporation, Annapolis, MD 21401.

Reports the results of the analysis of selected raw data and review of six studies by others on the cost impact of competition. The general conclusion is offered that savings of the order of 40% are achieved, however, a number of reservations are identified. Appendices include organizations contacted, abstracts of the six studies and excerpt descriptions of one of the studies.

Ott, E. J., and F. M. Robinson (RADM, Naval Material Command, and Naval Sea Systems Command, respectively).

Consideration of the Industrial Base in Formulating the Five-Year Shipbuilding Program (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 5-6. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Describes the importance of, and the difficulty of, maintaining a strong industrial base; outlines the contribution of the five-year program, the effect of secular changes, and proposed improvements.

Peterson, Jack G. (General Dynamics Pomona Division).

The Use of Fixed Price-Type Contracting Before Completion of Production Proofing (Executive Summary of article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 11-12. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Presents argument for use of negotiated contracts until production proofing and meaningful production experience provides base for establishing costs; suggests this is usually not available until after the first production procurement.

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Pompan, Jacob B. (Lt. Colonel, USAF, Air War College).

Development of Procurement Policy (Article).

Defense Industry Bulletin, Vol. 3, No. 4, April 1967, pp. 1-3, 10.

Describes the purpose and operation of the Armed Services Procurement Regulation Committee; of particular note is the highlighting of the flexibility in application of the ASPR which is provided in ASPR 1-109 and the development of a "procurement management survey system" which, among other things, evaluates "how effectively the procurement organizations are implementing the regulations and policies..."

Read, Leon R., and William F. Furr (Colonel and First Lieutenant, USAF, respectively).

The Impact of Quality Assurance on the Adequacy of Data for Air Force Reprocurement (Thesis).

Report No. SLSR-21-73A, March 7, 1973, 134 pp. Air Force Institute of Technology, Wright-Patterson AFB, OH 45433. AD 760094.

Inadequate contractor-prepared procurement data packages have impeded competitive procurements of replenishment spare parts by the Air Force. This thesis states that "The primary deterrent to competition lies in the government's inability to transfer required production technology to prospective new contractors." (p.120) DOD believes that at least a 25% savings can be realized simply through the introduction of competition during the procurement process. The biggest problem in the procurement data area is the difficulty encountered in assuring the technical adequacy of procurement data. A program for cost effectiveness is also presented.

Roberts, Edward B. and William H. Dyer, III (M.I.T.).

Follow-On Contracts in Government Sponsored Research and Development: Their Predictability and Impact (Article).

Sloan Management Review, Vol. 9, No. 2, Winter 1968, pp. 41-55.

Eighteen new business R&D contracts were investigated for three purposes: (1) to gain insights into the predictability of follow-on contracts; (2) to measure the effects of considerations of follow-on potential on contract performance; and (3) to examine the impacts of these factors on further contract acquisition. ...defense/space marketing men appear unable to predict effectively the dollar magnitude of the resulting follow-on contracts. ... companies that anticipated large follow-ons wrote into their initial R&D proposals promises of unrealistic time schedules, cost estimates, and technical performance goals. ...The empirical findings support a feedback system theory of the R&D contracting process that puts follow-on contracts into a closed-loop context. Analysis of this system leads to a proposal that more visible contractor penalties and rewards be used to improve over-all contracted R&D performance (Excerpts from authors' abstract).

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Schemmer, Benjamin F.

Anatomy of a Competition: Army's GSRS "Shoot-Off" Intensifies (Article).

Armed Forces Journal International, June 1979, pp. 16-17.

News story describing the intense competition during demonstration testing of Boeing Aerospace Company and Vought Corporation designs for the General Support Rocket System. While the competition is described as a "winner take all" proposition, the Army "will retain an option for second-source production of high volume items...after the winning contractor is selected for initial high-rate production." The story further points out that "If the European countries decide to produce GSRS on a production line, there would be no U. S. second source; in fact...the European participants could become the U. S. second source."

Shapiro, Albert (The University of Texas).

The Value of a Good Design Team (Article).

Proceedings DOD Procurement Symposium: Progress and Research in the Seventies, Wright-Patterson AFB, OH, February 23-24, 1972, pp. 113-124. Available from Air Force Institute of Technology, Wright-Patterson AFB, OH 45433.

Emphasizes the idea that procurement practices operating in the direction of developing and maintaining competent specialist teams add to the ability of DOD to get more research and development per dollar. Conclusions are drawn from a study involving comparison of French and American programs which were simultaneously developing comparable aircraft which were destined to compete with each other in the market. Specific steps and examples were presented to assist in developing and maintaining good design teams.

Sherman, Stanley N. (The George Washington University).

Strategy Models Employed by Federal Acquisition and Procurement Managers (Executive Summary of Paper).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 67-68. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Summarizes a fuller discussion in a (non-referenced) study; presents a model of the acquisition manager, his objectives, and his four general strategies.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Spencer, David T. (Major, USAF, Air Command and Staff College).

Alternative for Shortening the Systems Acquisition Cycle: Milestone 0 to DSARC II (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 29-32.
Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Recommends a number of changes in the process, including ways of shortening the time for the three multiple award and consecutive competitive source selections derived from A-109 requirements.

Ulrich, Keith A. (U.S. Army Procurement Research Office).

Should Cost: Guidelines for the Selection of Team Members (Report).

Report Number PRO-103, June 1973, 142 pp. U.S. Army Logistics Management Center, Ft. Lee, VA 23801. AD 772986.

This study reviews the personnel selection techniques commonly employed in business, and the personal characteristics normally considered in personnel selection. Observations are made regarding the applicability of these techniques and personal characteristics in selecting personnel for Army Materiel Command (AMC) Should Cost teams. The selection methods used to staff Should Cost teams in the past are then evaluated. This study concludes by offering guidelines for improving the process of identifying and selecting highly qualified personnel to perform Should Cost analyses (Excerpt from author's abstract).

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United States Air Force and Aerospace Industries Association.

Proceedings of Air Force/Industry Data Management Symposium, Beverly Hills, CA, September 28-30, 1965, 324 pp. Published by Ballistics Systems Division, Norton Air Force Base, CA 92409. AD 626032.

Examination of data management through five industry/government panels. Of particular interest are the extensive descriptions of the various data management systems, critical discussions of data requirements for competitive reprourement, data warranty (of fitness for use in reprourement), recommendation that contract require "technical assistance", and use of a "data associate contractor." One recommendation of specific interest is as follows: "Recommendation: ASPR 4-701 Leader Company Procurement. So many data rights problems result from the Government's desire for second source procurement, either for price competition or for security of geographical dispersion, that a simple solution to such second source procurement should be sought which allows the contractor and subcontractor to develop their own arrangements.

Leader company procurement where a design manufacturer furnishes manufacturing data to a second source selected by the Government has generally been less than satisfactory; however, industry abounds with successful examples of just such arrangements. The difference seems to be that industry provides an economic interest to the design manufacturer, as by royalties, in making the second source follower company successful. Where such second source price competition is desired, even a promise to each of 1/3 of the requirements with 1/3 extra to the low bidder would provide considerable incentive to lower costs, and the two companies could make their own arrangements subject to minimal approval by the Government."

Vaillant, Normand A. (Defense Systems Management School).

Competitive Reprourement of DOD Mobile Electric Power Generating Sources (Report).

Report No. FMC 75-2, November 1975, 28 pp. Defense Systems Management School, Fort Belvoir, VA 22060. LD No. 35056A. AD A 027286.

This study project was undertaken for the purpose of identifying, analyzing and highlighting the present day factors that affect reprourement of those systems that must be obtained competitively each and every time a contract is awarded. This project excludes small local purchases and major weapons systems and concentrates on the area in between these two extremes. The investigation correlates the formulation of an acceptable reprourement data package with a detailed review of each major area of concern that could represent some impact in the procurement of a like item or system which is interchangeable in form, fit and function with that previously procured. These major areas include drawing guidance, source control and commercial components, configuration management, design rights, standardization, kits/accessories and sole source procurement. Each area has a unique implication that should be thoroughly considered and understood before entering into a competitive procurement (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Williams, Robert F. (U.S. Army Procurement Research Office).

A Systematic Approach to Acquisition Planning for Contracting (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 47-48.
Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Emphasizes the variation in objectives and practice, and recommends, for each procurement, evaluation and structuring of objectives, and preparation of strategic and tactical plans, both based on review of prior experience and art.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

3. Background References

Anonymous (Logistics Management Institute).

Analysis of Extent of Competitive Procurement by DOD Prime Contractors (Report).

January 1964, 63 pp. Logistics Management Institute, Washington, DC 20016. AD 475780.

The report presents findings on prime contractor subcontract policies, concepts, and procedures regarding competitive procurement, and recommends a DOD guide on advance procurement planning, competitive forecasting, and summary progress reporting (Extract from author's preface).

Anonymous (Publication Staff).

EIA Symposium Delegates...Debate 3 Contracts Managing Systems (Article).

Electronic Week, April 28, 1958, p. 26.

News story reporting "EIA's first Symposium on Methods of Contracting." Historically interesting review of discussions on three different systems: 1) group or "team" contracting as exemplified by Hoffman Laboratories "Tall Tom" program, 2) "Leader-Follower Contracting, a refinement of the original Hazeltine Leadership Plan", and 3) Prime-Subcontractor Contracting, the traditional relationship. The description of leader-follower appears to be different from (and precedes) ASPR 4-701, as described by W. P. McFarland of Hazeltine Corporation who "cited the leader-follower technique not as a form of contracting, but as a method of performance, in which the prime must be equipped to manage a broad and extensive program, and be well equipped in facilities, finances, technical people and a special management philosophy."

Anonymous (Logistics Management Institute).

END Item/Subsystem Competitive Decision Analysis (Report).

July 1963, 74 pp. Logistics Management Institute, Washington, DC 20016. AD 472958.

While concerned with a review of a broader question, the report outlines (pp. 55-74) a variety of issues related to technical data, cost factors, and other areas which are of importance in reviewing or screening an item for competitive procurement.

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Anonymous (U.S. Army Audit Agency).

Laser Rangefinder and Ballistic Computer for the M60A3 Tank (Report).

Report No. NE 76-416, October 6, 1975, 26 pp. U.S. Army Audit Agency, Washington, DC 20315. LD No. 32222A.

Evaluates the reasonableness of the procurement plan for the AN/VVG-2 laser rangefinder and the XM-21 ballistic computer. Conclusions included that there was not enough data to determine whether the initial quantities of these should be procured on a sole source or competitive basis.

Anonymous (Dayton Section, Institute of Radio Engineers, Dayton, OH).

Subsystems Will be PGEM Subject (Article).

Waveguide (Specific citation unknown; probably Vol. 10, No. 4 or 5, December 1957 or January 1958; and is p. 11)

News story announcing a speech to the Dayton Section by James D. McLean, president of Hoffman Laboratories, Inc., on the "Management of Electronic Subsystems." Emphasizes potential in extending weapons system concept to teams of smaller specialized companies to increase choice of sources and competition.

Anonymous (Hoffman Electronics Corporation, Los Angeles, CA.)

Tall Tom: Air Force Awards \$11 million Systems Engineering Contract to Hoffman Laboratories (Article).

Hoffman Transmitter, Vol. 23, Nos. 1-2, January-February 1958, p. 5.

News story describing "a new concept in electronic systems management" variously described as the team approach or associate contractor approach, combining the technical and management skills of a prime and several sub-contractors into a closely integrated team.

Baloff, Nicholas

Startup Management (Article).

IEEE Transactions on Engineering Management, Vol. EM-17, No. 4, November 1970, pp. 132-141.

The causes and consequences of disrupted startups of new product and production processes are examined in relation to examples drawn from several, diverse industries. It is demonstrated that inappropriate management actions can often precipitate significant deviations from expected patterns of productivity increases during startups, resulting in important short- and long-run productivity losses. Based upon the discussion, several guidelines for effective startup management are suggested (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Baranson, Jack

International Transfer of Automotive Technology to Developing Countries
(Monograph).

UNITAR (United Nations Institute for Training and Research)
Research Reports, No. 8, 1971, 95 pp.

This study examines the role of foreign enterprise in the transfer of automotive technology to developing economies. It is based in part upon three previous publications of the author.

Bean, Alden S. and Enrique Romagosa.

Organizational Structure and Technology Transfer in a Large Decentralized Firm.

A paper presented at the Academy of Management Meetings in New Orleans, LA, March 1976, 43 pp.

The organization theory literature suggests that the level of effort devoted to the management of the interfaces among functional units in high technology firms will be related to its economic performance. The R&D management literature, however, contains little prescriptive information on effective coupling between central R&D and the operating divisions of the firm, with the exception of the structural principles advanced by Jack Morton, based on the Bell Labs experience. Data presented in this paper describes technology transfer outcomes in a large diversified firm, and provides little support for the explanatory power of the Morton model for this situation (Authors' abstract).

Bialik, J.J.

Another Look at Team Contracting (Article).

IEEE Transactions on Engineering Management, Vol. EM-7, No. 2, June 1960, pp. 67-69.

Previous discussions concerning group contracting have been presented from a group leader viewpoint. The need was felt to view the group contracting arrangements from the associate contractor viewpoint. The experiences gained by over two and one-half years association in a group contract arrangement as an associate contractor are described. Areas of concern not normally encountered in a conventional contracting arrangement are described for prospective group contracting participants (Author's abstract).

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INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Boddie, W. Lea

Impact of Changes in the Defense System Acquisition Cycle on Design Team Capability Retention (Student Project Report).

Report No. PMC 75-1, May 1975, 47 pp. Defense Systems Management School, Ft. Belvoir, VA 22060. AD A C27550.

Objectives of this report were to evaluate the effect of changes in the defense system acquisition process on the ability of the aircraft industry to retain the capacity of their design teams and to suggest solutions as well as identify the problems. Conclusions include the statement that recognition of the overall design capability as an important asset must be considered, if the evolving defense strategy is to be successful, and legislative and executive branch support is required.

Burt, David N. (Major, USAF, Air Force Institute of Technology).

Procurement and Acquisition Research by the Air Force Institute of Technology (Article).

Proceedings DOD Procurement Symposium: Progress and Research in the Seventies, Wright-Patterson AFB, OH, February 23-24, 1972, pp. 199-204. Available from Air Force Institute of Technology, Wright-Patterson AFB, OH 45433.

Reviews procurement and acquisition research through citations of recent faculty research, thesis research, and term papers.

Burt, David N. (Naval Postgraduate School, Monterey, CA).

Will Four-Step Solve the Problem? (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 93-94. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Summary of study of source selection process drawing upon experience of 22 San Francisco Bay area contractors; summarizes practices contributing to objectionable results, particularly because government is monopolistic buyer.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Chakrabarti, Alok K. and Albert H. Rubenstein.

Interorganizational Transfer of Technology: A Study of Adoption of NASA Innovations (Article).

IEEE Transactions on Engineering Management, Vol. EM-23, No. 1, February 1976, pp. 20-34.

This study investigated the effects of: seven techno-economic factors, extent of top management support, six dimensions of organizational climate, and three modes of joint decision-making, on the adoption of NASA innovations. Seventy-three cases in sixty-five organizations were studied. Data were collected through field interviews and questionnaires. Parametric influences of communication channels and involvement of the innovator were examined. Implications for organizational design were considered.

The data indicated that top management support was of primary importance in the success of product innovations. But techno-economic variables were of primary importance in the success of process innovations. The data also indicated that organizational climate and conflict resolution mechanisms were different in the successful and unsuccessful cases. Involvement of the innovator in implementation of the project was also found to be important (Authors' abstract).

Charles, Robert H. (Office of the Assistant Secretary of the Air Force, Installation and Logistics).

Effective Competition - A Key to Government Procurement (Article).

Defense Industry Bulletin, Vol. 1, No. 10, October 1965, pp. 3-4.

Historically interesting discussion of the extension of competition through use of a Contract Definition Phase and the further extension through the initiation of the total package concept (for the C-5A).

Cheney, William F. (Aeronautical Systems Division, AFSC).

Experience Curve Theory and the Product Life Cycle (Executive Summary of Article).

Research Paper Executive Summaries Eighth Annual DOD/FAI Acquisition Research Symposium, Naval War College, Newport, RI, May 2-4, 1979, pp. 91-92. Available from Defense Systems Management College, Ft. Belvoir, VA 22060.

Graphical presentation of the two concepts.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Comer, James M., et al.

The R&D and Marketing Interface: The Case of the Lithium-Iron Sulfide Battery.

A Paper Presented to Atlanta Joint National ORSA/TIMS meeting, November 7, 1977, 13 pp.

This paper presents a discussion of a research project done at Argonne National Laboratories concerning the development of the Lithium-Iron Sulfide battery. The battery's development was a response to a projected market need for a petroleum substitute. The research and development effort was a joint project between the government and the private sector. To date, there has been some interaction between industrial marketers and the developers at Argonne. It appears that as the battery project moves further into the applications engineering phase, deeper and more continuing relationships between marketers and R&D representatives are developing.

Comptroller General of the United States.

Report to the Congress on The NAVSTAR Global Positioning System-- A Program with Many Uncertainties (Report).

Report No. PSAD-79-16, January 17, 1979, 22 pp. U.S. General Accounting Office, Washington, DC 20548. B-163058.

General topics of user needs, force effectiveness, replacement plans, and cost savings opportunities for full-scale engineering development are discussed. Also recognized is the non-inclusion of Army and Navy funding for user equipment development in the original program plan; thus, additional funding may be required from the Army and Navy to support dual contractor user equipment development (p. 14). Also, original (December 1973) and current (October 1978) event schedules are contained, including "user equipment four-contractor competition to start" and "user equipment final contracts awards--two contractors" (p. 18).

Comptroller General of the United States.

Report to the Congress on Potential Savings in the Procurement of Spare Aircraft Parts for Outfitting Aircraft Carriers (Report).

Report No. B-133118, February 1967, 28 pp. U.S. Army Logistics Management Center, Fort Lee, VA 23801. LD No. 11851.

Examines the noncompetitive purchase of spare parts by the Department of the Navy for use on aircraft placed aboard aircraft carriers. Although a stated policy is that the purchase of parts be done competitively whenever feasible, this is not enforced in practice. The report states that spare parts for the initial support of certain aircraft weapon systems were being purchased by the Navy from the airframe manufacturer on a sole-source basis although the majority of the parts were manufactured by other sources from which the government could have obtained the parts at a significant reduction in price. Conclusions included the belief that it is practicable to buy a substantial portion, if not all, of the parts from manufacturers on a competitive or direct basis.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Comptroller General of the United States.

Report to the Congress on Recommendations of the Commission On Government Procurement: A Final Assessment (Report).

Report No. PSAD-79-80, May 31, 1979, 117 pp. B-160725.

This eighth status report on recommendations proposed by the Commission on Government Procurement in December 1972 states that there is incomplete response to the recommendations and that the momentum is slowing.

Department of Defense.

Conference on Program Management Conference Proceedings (Report).

May 1963, 113 pp. U.S. Army Logistics Management Center, Fort Lee, VA 23801. LD No. 26453.

Objectives included a review of new incentive developments in procurement, contract administration, and program control; an analysis of limitations; a review of contractor selection criteria; a discussion of the degree of competition desirable in the initial and follow-on procurement of systems and programs; and an identification of ways and means of achieving the lowest net cost to the government through competitive breakout. Major topics were incentive contracts, source selection, and contractor competition. (This summary is based on pp. 100-115 material.)

Dickison, W. E., and R. W. Pollock.

Some Problems With Diminishing Manufacturing Sources in Logistics Support (Paper).

Report No. WP-76-14A, October 1977, 73 pp. HQ AFLC/XRS, Management Sciences Office, Wright-Patterson AFB, OH 45433. LD No. 43752A.

One of the Air Force Logistics Command's prime concerns is to maintain the level of support necessary to insure that various weapon systems are in a high state of readiness. This is becoming increasingly difficult under budget constraints, material shortages, and diminishing manufacturing sources (DMS) (Authors' abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Donovan, David A., and Charles R. Privateer (Lieutenant Commanders, USN).

Case Studies in Subcontracting (Thesis).

March 1974, 181 pp. Naval Postgraduate School, Monterey, CA 93940.
AD 770545.

Subcontractors play a significant role in government procurement and are essential to an effective procurement process. Current estimates of DOD procurement show that at least 50 percent of prime contract funds are subcontracted. A series of three case studies has been developed to illustrate major concerns in subcontracting. The cases are designed to introduce the student to subcontracting and to the specific procedures and requirements of contractor procurement system reviews, subcontract review and consent by the government, and subcontractor source selection. Particular attention has been paid to an examination of subcontracting from the point of view of both the prime contractor and the government as well. Teaching commentaries are included to assist the instructor (Authors' abstract).

Ettlie, John E., and Albert H. Rubenstein.

Social Learning Theory and the Implementation of Product Innovation (Unpublished paper).

September 1979. Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL 60201.

Describes a study of the introduction of numerically controlled machine tools in several industrial companies and identifies factors influencing success of adoption.

Falk, James E. (The George Washington University).

Optimal Vendor Selection with a Total Capacity Requirement (Report).

Report No. T-249, June 1971, 23 pp. The George Washington University, Institute for Management Science and Engineering, Washington, DC 20037.
AD 728394.

The problem of selecting vendors in such a way that the total cost is minimized subject to satisfying minimal production requirements is considered. A further restriction requiring that the vendors selected by an optimal policy have a total production capability exceeding a given amount is imposed. The problem is interpreted as a combinatorial problem. A search and elimination procedure for its solution is presented (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Fischer, Bruce.

Success in Passing (an R&D Project From Development at a Centralized Lab into Production at a Division) (Unpublished Paper).

November 1978, 10 pp. Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL 60201.

Reviews a number of factors related to the effective passing of technology into production.

Fischer, Bruce, et al.

The Problem of Interface between R&D and Production in a Large Chemical Manufacturing Company (Unpublished notes).

June 1979. Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL 60201.

Working notes on organizational design project, including references to prior state-of-the-art, background information on client organizations, and analysis of organizational design problems.

Giberson, W. Eugene.

Management of Technology Transfer in an Advanced Project - The Case of Surveyor (Article).

IEEE Transactions on Engineering Management, Vol. EM - 16, No. 3, August 1969, pp. 125-129.

This paper uses a specific advanced project--the Surveyor-- as a basis for presenting a number of problems in technology transfer and the methods used to solve the problems.

The paper emphasizes the importance of mission orientation to transfer and outlines the several organizational approaches that were tried before assigning full-time project groups within the discipline departments.

Several examples of planning problems are followed by a description of the organizational methods developed to deal with them. These include "working residencies," independent evaluation of prototypes and analysis by the user in parallel with the provider, design reviews, failure-mode analysis, and problem-failure reporting (Author's abstract).

Ginn, Martin E.

R&D Interface with Production (Unpublished paper).

January 1978, 22 pp. Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL 60201.

An analysis of selected factors affecting the interface process, including illustrative cases, a classification scheme, and diagnostic instruments.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Grayson, Anthony S., and Harold J. Lanclos (Captains, USAF, School of Systems and Logistics, Air Force Institute of Technology).

A Methodology for Subjective Assessment of Probability Distributions (Thesis).

Report No. SLSR 13-76B, September 1976, 149 pp. Air Force Institute of Technology, Wright-Patterson AFB, OH 45433. AD A 032536.

Examines a number of techniques for assessing subjective probability for application in the initial stages of development of a weapon system to assess the magnitude of uncertainty present.

Hall, G. R. and R. E. Johnson.

Competition in the Procurement of Military Hard Goods (Paper).

Report No. P-3796, March 1968, 33 pp. The RAND Corporation, Santa Monica, CA 90406. LD No. 18464.

Generally, the DOD has been successful in obtaining price competition for goods and services with close civilian counterparts--e.g., clothing, janitorial services, etc. However, in the procurement of highly specialized military items, there are substantial barriers to competition, and the DOD has been less successful in obtaining competition. Thus, this paper concentrates on addressing a major issue in defense procurement--how to obtain price competition for the specialized military goods and services. A corollary issue is how to protect the public interest in procurements where competition cannot be relied upon for protection.

Hawkins, Willis M.

Technology Transfer Programs at Lockheed (Article).

IEEE Transactions on Engineering Management, Vol. EM-16, No. 3, August 1969, pp. 121-125.

This paper presents the technology transfer experience of a large company in terms of the policies of the company and the mechanics of technical management, including descriptions of specific transfer mechanisms, such as the research council, engineering council, technical symposia, corporate coordinators, "corporate attention" projects, and ad hoc groups.

The objectives and methods upon which long-range planning is based are presented as an example of another transfer process, and some of the unsolved problems are discussed (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Henderson, Ross.

Measurement of Productivity Growth During Plant Startup (Article).

IEEE Transactions on Engineering Management, Vol. EM-25, No. 1, February 1978, pp. 2-8.

Measurement of productivity growth at thirty continuous steel casting plants disclosed universally long startup duration ranging from one to six years. This research finding extends the development of productivity growth measurement, which began with the aircraft learning curve forty years ago, to a significantly sized sample taken from one new machine-intensive technology. The manufacturing progress function, which is the inverse of the learning curve, was the model used for measurement. Log-log graphs of data from these thirty plants, which are located in ten countries, on four continents, provide visual evidence of regular productivity growth during startup. Statistical results from linear regression of its logarithmic transformation show that the manufacturing progress function describes startup very well. This description is improved by three new parameters of the function which have been introduced and defined here. The new parameters are: manufacturing progress, startup duration, and lost capacity. These improved measurements developed in the continuous steel casting technology are generalizable to many other machine-intensive technologies. As a result, there are a number of implications for engineering managers which can lead to better measurement, control, prediction, and acceleration of startup (Author's abstract).

Hillier, James.

Venture Activities in the Large Corporation (Article).

IEEE Transactions on Engineering Management, Vol. EM-15, No. 2, June 1968, pp. 65-70.

Discussed is how a large corporation responds to different levels of product innovation between the time they occur and their introduction into the marketplace. A centralized research laboratory of a diversified corporation has a specific role as an interface between the scientific world, which requires a high level of scientific endeavor, and the business world, which requires innovations to justify expenditures. From the product development point of view, there are weaknesses inherent in operating divisions of a corporation on a decentralized basis and indicated are some of the methods used to overcome the obstacles to transferring technology that result from this organizational structure. The methods used at the various levels of product innovation include 1) "selling" incremental improvements, 2) "applied research" funding, 3) corporate funding of existing divisions, 4) establishment of new divisions, and 5) establishing a corporate entrepreneurial task force to operate across divisions. There are also comments on the effect of an entrepreneur in a key management role and on the effect of competition, presumed or actual (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Hunt, Raymond G. (State University of New York at Buffalo).

Extra-Contractual Incentives and the Award Fee (Article).

Proceedings DOD Procurement Symposium: Progress and Research in the Seventies, Wright-Patterson AFB, OH, February 23-24, 1972, pp. 75-110. Available from Air Force Institute of Technology, Wright-Patterson AFB, OH 45433.

Topic involves "actually anything that affects the work encompassed by a given contract in any manner not specifically and directly traceable to the terms and provisions of that contract" (p. 75). After briefly reviewing the history of these influences, the author suggests that it seems appropriate to move toward R&D contracting formats which define, embody, and need a certain relationship between the procuring agency and the contractor organization. Although federal procurement policies place the main emphasis on profit maximization, they repeatedly make reference to the importance of extra-contractual, non-profit motivations in determining contractor performance, although they recognize that the government does not have the means to quantify these. An admittedly oversimplified incentive model is included, along with a discourse concerning the topic of award fee contracting.

Jervis, Paul.

Innovation and Technology Transfer - The Roles and Characteristics of Individuals (Article).

IEEE Transactions on Engineering Management, Vol. EM-22, No. 1, February 1975, pp. 19-27.

Project SAPPHO, which studied differences between success and failure in innovation, produced information both on the roles played by individuals in the innovation process and on the characteristics of those associated with success. Although the data do not permit as detailed an analysis as other studies which have concentrated specifically on gathering information about people, they do enable some of the existing ideas to be reviewed. Results show little support for the belief that "Product Champions" can challenge and overcome organizational unsuitability or indifference, but suggest rather that the power, commitment and experience of the Innovation Managers are crucial factors (Author's abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Joshi, B.

International Transfer of Technology System (Article).

IEEE Transactions on Engineering Management, Vol. EM-24, No. 3, August 1977, pp. 86-93.

The nature, cost, and impact of the complex phenomenon of international transfer of technology have been studied at some length, but those concerning the transfer process have yet to draw adequate attention. This paper attempts to describe the international transfer of technology process at a microenterprise level with the help of the systems approach. The causal interrelationship between these elements and their components is argued. Next, the model is utilized to analyze an actual case of technology transfer. There, the particular systems output performance is evaluated, and the behavioral abnormalities are explained against the peculiarities of its internal structure. The paper thus demonstrates the use of the system in analyzing the process of international transfer of technology. The case study also identifies the implications of various elements of the internal structure on the overall performance of the system (Author's abstract).

Kohler, B.M., et al.

A Behavioral Study of International Technology Transfer Between the United States and West Germany (Article).

Research Policy, Vol. 2, 1973, pp. 160-184.

The process of transfer of technology across national boundaries has been the subject of increasing theorizing and case studies, but little in-depth research... Methodological problems and some alternatives are presented... (Excerpt from authors' abstract).

Martin, John J. (Office of the Assistant Secretary of the Air Force for Research, Development and Logistics).

Remarks at the Electronic Industries Association Symposium, Washington, DC, April 4, 1979 (News Release).

11 pages.

Reviews the challenges faced by the nation and some of the actions the Air Force is taking, including encouraging more competitive contract awards through equipment breakout, multiple sources through the full scale engineering development phase, followed by either competitive production contracts or continuing multiple sources and competition into the production phase. "These actions will, we anticipate, contribute to controlling inflation and result in lower prices for our major systems." In addition, other related steps include reducing weapons systems life cycle costs; a new policy to account for rapid advances in technology and problems of complexity, lack of commonality, high cost, and poor reliability; new planning activities to maintain daily contact with changes in avionics requirements; initiatives to shorten the systems acquisition cycle, including formal mission needs statements and streamlining the review and decision-making process; combining development testing and operational testing; and improvements in source selection and costing.

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INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

McKie, James W. (Rand Corporation).

Proprietary Rights and Competition in Government Procurement (Report).

Memorandum RM-5038-PR, June 1966, 71 pp. The RAND Corporation, Santa Monica, CA 20330. AD 639732.

Summary discussion based on interviews and documentary sources. Reviews policy changes in 1955, 1958, and 1965 to clarify and increase the government's rights in data. Points out that competitor in absence of data, is required to carry out "reverse engineering" to determine design and process data from the hardware itself. Discusses "limited rights" and "unlimited rights", data licensing, the law of trade secrets, inadequate data vs. "unneeded data", Competition-With-Confidence Program (high-dollar spare parts breakout), "criticality", the "private expense test", deferred ordering provision, economics of proprietary rights, and proprietary rights of subcontractors and vendors. Discusses policy alternates, including unlimited rights, purchasing data rights, licensing systems, limited rights, breakout, and control of design (standardization). Lists CWC criteria, intended uses for data, and category specifications for engineering drawings.

Merritt, W., et al. (Northrop Corporation)

Micor-Electrostatic Gyro (MESG), MESG Second Source Development Program (Final Report).

Report No. AFAL-TR-76-150, August 1976, 181 pp. Air Force Avionics Laboratory, Wright-Patterson AFB, OH 45433. AD A 038273.

The objective of the MESG Program was to develop a competent, competitive second source for the fabrication of rotor and cavity sets; this program was needed to protect the government's investment and to prevent the prime contractor from obtaining a sole source advantage. Procedures generally described include a review of the Reprocurement Data Package supplied by the Air Force and the establishment of alternative sources.

Moore, Cary A. (Bell Helicopter Company).

Single Vendor Integrity (Article).

Logistics Spectrum, Vol. 10, No. 1, March 1976, pp. 13-18.

This approach is defined, along with problems associated with it and resultant benefits. The advantages include 1) significant distance between customer and manufacturers, 2) customer maintainability of a limited supply and maintenance facility, 3) total quantity of end item procurement being smaller than that of a typical U.S. government purchase, 4) the end item product containing a significant number of repairable vendor items, and 5) logistics support costs representing a significant portion of the total program cost. Disadvantages include production cost, material cost, problems with vendor due to sole source situation limitation of customer flexibility for changes, and limitation of end item manufacturer design improvement changes.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Moore, John R.

The Technology Transfer Process Between a Large Science-Oriented and a Large Market-Oriented Company - The North American Rockwell Challenge (Article).

IEEE Transactions on Engineering Management, Vol. EM-16, No. 3, August 1969, pp. 111-115.

This paper discusses the opportunities and problems presented in the transfer of technology in a very large company between its aerospace group and commercial products group.

The process is presented in terms of the definition and value of technology, the difficulties of transfer, the objectives to be accomplished, the uses of transfer, and the management of transfer, including techniques for improving transfer. Emphasis is placed upon the practical economics of the process, the organization and motivation of people, and the various mechanisms, such as committees, a "switchboard" group, and other communication means that are being developed (Author's abstract).

Morris, Thomas D. (Office of Assistant Secretary of Defense, Installations and Logistics).

Better Performance and Control of Costs in Defense Contracting (Article).

In Government Contracts and Procurement - Current Trends (Lectures presented at The Southwestern Legal Foundation Second Annual Institute on Government Contracts, Dallas, TX, November 8-10, 1962). New York: Commerce Clearing House, Inc., 1963, pp. 205-214.

Historically interesting description of "current" efforts to improve defense management; notes (p. 206) that "we are aware that efforts to change and improve at times produce unintended and undesirable results - as well or good"; says that savings of about 25% can result where sound competition exists; discusses importance of timely production drawings and data; notes efforts to break out parts and the competition achieved through contracting; reports ASPR changes to preference for FFP and IC; and adds note on PERT and VE.

Morton, Jack A.

International Science and Technology, May 1964, pp. 82-91.

The man who heads components research and engineering tells how Ball Labs converts research to new technology. He calls it a "people process" (Article headnote).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

O'Leary, Arthur J., Jr. (Captain, USA).

The Effectiveness of Price Competition on Cost Growth Rates of Aviation Secondary Items and Repair Parts (Paper).

November 1975, 26 pp. U. S. Army Logistics Management Center (Florida Institute of Technology), Fort Lee, VA 23801. LD No. 34735A.

Since the early nineteen-sixties, emphasis has been placed on increasing the proportion of production contracts on a competitive basis since it is generally accepted that the probability of obtaining the lowest available price increases as the number of bids received increases. The purpose of this research is to question the ASPR 1-304.1 (1) policy requiring maximum competition by determining whether price competition has had a significant effect on the cost growth trends of Army Aviation secondary items and repair parts during the past five years which have seen such high inflation (Author's abstract).

O'Neill, John W. (Lieutenant General, ASFC Space and Missile Organization, USAF).

Space and Missile Systems Organization - Working Partner with Industry (Article).

Defense Industry Bulletin, Vol. 5, No. 10, October 1969, pp. 1-5, 28.

News story describing overall program and internal organization of SAMSO, including brief description of application of associate contractor approach to the Minuteman Program, and the satellite control facility program.

Patnode, Clarence A., Jr. (Lieutenant Colonel, USA).

Problems in Managing Competitive Prototype Programs (Report).

November 1973, 26 pp. Defense Systems Management School, Fort Belvoir, VA 22060. LD No. 32946A.

Examines current problems of managing competitive prototype programs to assist defense system managers. Concentrates on the situation of driving both competitors to a single design, with a cross flow of design between contractors.

Pownall, Thomas G. (Martin Marietta Corporation).

Research and Development Acquisition (Article).

Proceedings of the Sixth Annual Department of Defense Procurement Research Symposium, West Point, NY, June 1977, pp. 428-430. Available from U.S. Army Procurement Research Office, U.S. Army Logistics Management Center, Fort Lee, VA 23801.

Discusses the expected effect of OMB Circular A-109 on independent research and development; comments also that "There is no money to be made, fundamentally, in the R&D area."

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Rannback, William O. (Lt. Colonel, Air Force Systems Command)

AF Management of Engineering Data (Article).

Defense Industry Bulletin, Vol. 1, No. 4, April 1965, pp. 1-2, 17.

Historically interesting brief review of the various manuals and regulations developed in the early 60's to deal with the conflicting objectives of minimizing the burden of data requirements while assuring the availability of data for procurement and other purposes.

Rhea, John (Washington Communications Services).

Defense! Defense! What to Look for Before You Join the Team (Article).

New Engineer, Vol. 7, No. 5, May 1978, pp. 25-26, 28-29, 32.

Business news type of article describing problems and prospects of the defense industry, with emphasis on employment of engineers; includes tabular and text summaries of leading contractors and major programs, and anecdotal and evaluative commentary on industry views of the defense market and strategies for acquiring and keeping programs.

Rich, Michael D. (RAND Corporation).

Competition in the Acquisition of Major Weapon Systems: Legislative Perspectives (Report).

Report No. R-2058-PR, November 1976, 84 pp. The RAND Corporation, Santa Monica, CA 90406. AD A 038743. LD No. 39569A.

Examines the idea of promoting greater competition in the acquisition of major weapons systems from the perspective of Congress. Primary direct benefits include lower prices and greater technical achievement; competition also secures fairness. Also addresses the congressional attitudes toward competition between would-be contractors for major weapons systems, and discusses the RAND distinction between "competition" and "rivalry."

Richardson, John H. (Hughes Aircraft Company).

Defense Systems Acquisition: Working Toward Improving the Process (Article).

Proceedings of the Sixth Annual Department of Defense Procurement Research Symposium, West Point, NY, June 1977, pp. 422-427. Available from U.S. Army Procurement Research Office, U.S. Army Logistics Management Center, Fort Lee, VA 23801.

Reviews "a series of small top level 'tell it like it is' meetings through which significant problems have been identified and acted upon." In addition, notes several areas which have not yet been resolved, including taking into account contractor's past performance in the source selection process and providing reasonable funding levels in competitive prototyping programs.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Riordan, John J. (Office of the Secretary of Defense).

Cults, "Ilities" and Systems Management (Article).

Defense Management Journal, Vol. 5, No. 2, Spring 1969, pp. 6-10.

Erudite review and commentary on developments and techniques for management, including procurement and costing techniques; provides a framework and/or context for relating various techniques and their application, including a number of closely related to leader/follower, but without explicit reference.

Rothwell, Roy.

Some Problems of Technology Transfer into Industry: Examples from the Textile Machinery Sector (Article).

IEEE Transactions on Engineering Management, Vol. EM-25, No. 1, February 1978, pp. 15-20.

Since the Second World War the textile machinery industries in the advanced Western countries have undergone a technological revolution. Not only has the pace of technical change increased, but much of this change has become technically more radical than before, often embodying techniques from other sectors. This paper outlines the attempts of a number of machinery manufacturers to import technology and technical expertise from a variety of external sources including universities, Government laboratories, and technical consultants. It shows that while the characteristics of the various donor and recipient organizations might differ greatly, the factors associated with the success or the failure of the transfer attempts are often similar. More importantly it shows in almost all the failure cases described, that with proper management they could have been transformed into successful transfers leading to successful innovations (Author's abstract).

Rubenstein, Albert H., et al. (IASTA, Inc., Evanston, IL 60201)

Conceptual Analysis for the Development of an Acquisition Information System (Report).

January 31, 1979, 80 pp. Available through Logistics Management Institute or Federal Acquisition Institute.

While concerned primarily with the stated subject area, of value as background reference to sources of information on the acquisition process.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Rubenstein, Albert H., et al.

An Organizational Design Approach to Project Management in a Government Research and Development Organization (Unpublished paper).

A paper prepared for presentation at the 1979 IEEE Engineering Management Conference, November 5-7, 1979, Arlington, VA.

The authors have recently been involved in an attempt to approach the problem (of matrix management) from an "organizational design" point of view...This paper describes the methodology used, some of the problems encountered, and some of the recommendations made to the client organization (Excerpts from authors' abstract).

Runkle, Jack R. and Gerald D. Schmidt (Captains, Air Force Institute of Technology).

An Analysis of Government/Contractor Interaction as a Motivator of Contractor Performance (Master's Thesis).

Report No. SLSR 19-75B, August 1975, 90 pp. Air Force Institute of Technology, WPAFB, OH 45433. AD 016 034.

Study of 56 NASA contracts with findings supporting a direct relationship between "influential government/contractor interaction" and "higher performance ratings."

Saint-Rossy, Dan T., et al.

International Transfer of Technology, An Evaluation of the Education and Training Component (Report).

May 1976, 28 pp. POMRAD, Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL 60201

Empirical study based on interviews with 61 transnational corporations in the United States.

Stineback, G. C. (Kendall Company, Chicago, IL).

Transition from Research to Production and Sales - A Case History (Article).

Research Management, Vol. 6, No. 2, 1963, pp. 125-133.

Report of one of the case studies presented at an Industrial Research Institute Study group conference; describes the interactive research-development-production-marketing successes and failures and summarizes the critical lessons learned, including importance of continuity, coordination and communication.

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Thompson, Charles W. N. (Northwestern University, Evanston, IL 60201).

The Functional Value of Uncertainty in the Procurement Process (Article).

Proceedings Seventh Annual Acquisition Research Symposium, Hershey, PA, May 31-June 2, 1978, pp. 127-133. Available from Air Force Business Research Management Center AFBEMC/LEPB, Wright Patterson AFB, OH 45433.

Describes uncertainty not only as a problem in the procurement process but also, when identified and analyzed, as a useful basis for developing solutions which minimize its effect. The effect of reducing uncertainty among bidders is particularly relevant to leader/follower.

United States Air Force.

Guide to Procurement Information (USAF Publication).

AF Pamphlet 70-8, June 1972, Headquarters, USAF, Washington, DC 20330.

Index based on ASD Acquisition Information Digest System which provides a Key Word in Context (KWIC) Index based on abstracts of the ASPR and various USAF publications. Of interest here because it references ASPR 4-701, and is the only index found, in this preliminary search, which has made explicit reference to leader/follower or leader company procurement.

Van Orden, M. D. (Decisions and Designs, Inc.; formerly RADM, with research and engineering assignments).

Management by Decision (Article).

Signal, Vol. 33, No. 1, September 1978, pp. 35-39.

Brief, well written tutorial on techniques and applications of decision analysis, including resource allocation, source selection and negotiations in a military context.

Williams, William B., and C. Eugene Beackler.

Change Order Administration (Final Report).

Report No. APRO-406, July 1975, 49 pp. U.S. Army Logistics Management Center, Fort Lee, VA 23801. AD A 031104.

This report assesses change order administration in the Army Materiel Command (AMC). It specifically addresses the timeliness of change order definitization and the adequacy of procurement change order policy. Finally, it deals with the constructive change order and its impact on Army contracting. Although the report concludes that change order administration in AMC is relatively effective, recommendations are offered which should further reduce the incidence of change order problems and preclude potential problems with constructive changes (Authors' abstract).

INTERNATIONAL APPLIED SCIENCE AND TECHNOLOGY ASSOCIATES, INC. (IASTA)

Zusman, Morris, et al. (Institute for Defense Analyses).

A Quantitative Examination of Cost Quantity Relationships, Competition During Reprocurement, and Military Versus Commercial Prices for Three Types of Vehicles, Volume I (Report).

Report S-429, March, 1974, 290 pp. Institute for Defense Analyses, Arlington, VA 22202. AD 784335.

Is an executive summary of a study whose objectives were to 1) identify and quantify factors which affect the cost-quantity relationship of a system; 2) quantify the effect of competition on the government-paid price; and 3) test the hypothesis that commercial procurement practices result in prices that are less than prices paid by the military for similar equipment. Results: lot size was a significant factor, significant savings occurred when competition was introduced during the reprocurement phase of selected programs, gross savings declined for each succeeding competitive award, and no significant price difference was found between commercial and military aircraft.